

**SOL All.1a**

The student, given rational, radical, or polynomial expressions, will  
a) add, subtract, multiply, divide, and simplify rational algebraic expressions;

**Hints and Notes****Rules for fractions:**

- 1) Always factor any squared terms completely – watch for greatest common factors
- 2) Addition & Subtraction of fractions require a common denominator
- 3) When dividing fractions – flip the second fraction and multiply
- 4) Complex Fractions – simplify numeration, simplify the denominator, then divide

**PRACTICE All.1a**

1. Simplify:  $\frac{a+2}{2a} + \frac{1-a}{a^2}$

A.  $\frac{a^2+2}{2a^2}$

B.  $\frac{a^2+2}{2a^3}$

C.  $\frac{a+1}{a}$

D.  $\frac{a+2}{2a}$

2. Simplify:  $\frac{1-\frac{x}{y}}{\frac{1}{x}-\frac{1}{y}}$

F.  $\frac{1}{y}$

G.  $\frac{1}{x}$

H.  $\frac{y-x}{xy}$

J.  $x$

3. Simplify:  $\frac{3m^2+2m-1}{m^2-1}$

A.  $3-2m$

B.  $3+2m$

C.  $\frac{3m-1}{m-1}$

D.  $\frac{3m+1}{m-1}$

**PRACTICE All.1a**

4. Multiply:

$$\frac{x+1}{4x+y} \cdot \frac{16x^2-y^2}{2x^2+5x+3}$$

F.  $\frac{4x^2-y^2}{2x+3}$

G.  $\frac{4x-y}{2x+3}$

H.  $\frac{4x+y}{5x+5}$

J.  $\frac{4x-y}{5}$

5. Multiply:

$$\frac{x+4}{3x+4y} \cdot \frac{9x^2-16y^2}{2x^2+13x+20}$$

A.  $\frac{3x-4y}{2x+5}$

B.  $\frac{3x^2-4y^2}{2x+5}$

C.  $\frac{3x-4y}{7}$

D.  $\frac{3x-4y}{7x+13}$

6. Divide:

$$\frac{2x^2+15x+25}{2x^2+13x+20} \div \frac{x^2+7x+10}{-4x^2-24x-32}$$

F.  $-4$

G.  $-3$

H.  $x+2$

J.  $x+5$

7. Divide:  $\frac{2x^2+x-3}{2x^2-7x-15} \div \frac{x^2+2x-3}{-4x^2+8x+60}$

A.  $x-1$

B.  $-3$

C.  $-4$

D.  $x+3$

8. Simplify:

$$\frac{\frac{x^2+6x+9}{20x}}{\frac{x+3}{4x}}$$

F.  $\frac{x+9}{5x}$

G.  $\frac{x-3}{5}$

H.  $7x+3$

J.  $\frac{x+3}{5}$

9. Simplify:

$$\frac{\frac{x^2-16x+64}{24x}}{\frac{x-8}{4x}}$$

A.  $\frac{x+64}{6x}$

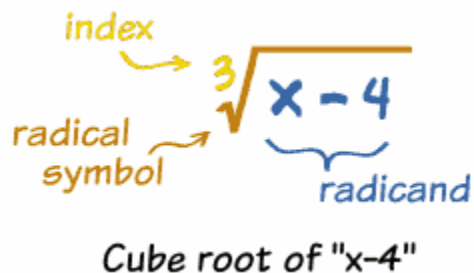
B.  $\frac{x+8}{6}$

C.  $\frac{x-8}{6}$

D.  $-15x-8$

**SOL AII.1b**

The student, given rational, radical, or polynomial expressions, will add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents;

**HINTS AND NOTES****Simplify Radicals**

- 1) Take root of coefficient
- 2) Divide exponents of radicand by the index; answer outside, remainder inside

**PRACTICE AII.1b**

1. Simplify:  $\sqrt[3]{27y^9}$ 
  - A. 3
  - B.  $3y$
  - C.  $3y^3$
  - D.  $3y^6$
2. Simplify:  $\sqrt[5]{x^{18}y^{22}}$ 
  - F.  $x^3y^4\sqrt[5]{x^3y^2}$
  - G.  $x^3y^2\sqrt[5]{x^3y^4}$
  - H.  $x^{13}y^{17}\sqrt{xy}$
  - J.  $x^3y^4\sqrt{x^3y^2}$
3. Simplify:  $\sqrt{6x^5y} \cdot \sqrt{4xy^4}$ 
  - A.  $4x^3y\sqrt{6y}$
  - B.  $2xy\sqrt{6}$
  - C.  $2x^3y^2\sqrt{6y}$
  - D.  $4x^6y^5\sqrt{6}$
4. Simplify:  $\sqrt{\frac{6x^5}{3x^6}}$ 
  - F.  $2x$
  - G.  $\sqrt{2x}$
  - H.  $\frac{2x}{x}$
  - J.  $\frac{\sqrt{2x}}{x}$

## **HINTS AND NOTES**

### **Adding & Subtracting Radical Expressions**

Only radical expressions with like radicands (stuff under the radical) can be added or subtracted.

### **Rationalize Denominator**

$\sqrt[3]{32}$  index or root is 3

radicand is 32

The radicand contains no fractions in the answer.

No radicals can be in the denominator of the answer.

## **PRACTICE AII.1b**

5. Simplify:  $-\sqrt{5} - 2\sqrt{49} + 2\sqrt{20}$

- A.  $-11\sqrt{5}$
- B.  $3\sqrt{5} - 14 + 2\sqrt{20}$
- C.  $3\sqrt{5} - 14$
- D.  $-\sqrt{74}$

6. Simplify:  $8\sqrt{7} - \sqrt{4} + 6\sqrt{63}$

- F.  $24\sqrt{7}$
- G.  $26\sqrt{7} - 2$
- H.  $13\sqrt{74}$
- J.  $26\sqrt{7} - 2 + 6\sqrt{63}$

7. Rationalize the denominator:  $\frac{4}{\sqrt{11}}$

- A.  $\frac{\sqrt{4}}{11}$
- B.  $4\sqrt{11}$
- C.  $\frac{4\sqrt{11}}{121}$
- D.  $\frac{4\sqrt{11}}{11}$

8. Rationalize the denominator:  $\frac{\sqrt{x}}{\sqrt{2}}$

- F.  $\frac{\sqrt{2x}}{4}$
- G.  $\frac{\sqrt{x}}{2}$
- H.  $\frac{x}{2}$
- J.  $\frac{\sqrt{2x}}{2}$

## HINTS AND NOTES

### Multiplying & Dividing Radicals

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$$

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$$

Conjugate pairs:  $a + \sqrt{b}$  and  $a - \sqrt{b}$

### Properties of Rational Exponents

1.  $a^m \cdot a^n = a^{m+n}$

2.  $(a^m)^n = a^{mn}$

3.  $(ab)^m = a^m b^m$

4.  $a^{-m} = \frac{1}{a^m}$

5.  $\frac{a^m}{a^n} = a^{m-n}$

6.  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

## PRACTICE AII.1b

9. Multiply:  $(4 - \sqrt{3})(4 + \sqrt{3})$

A.  $19 - 8\sqrt{3}$

B. 19

C.  $13 - 8\sqrt{3}$

D. 13

10. Divide:  $\frac{3}{6 - \sqrt{5}}$

F.  $18 + 3\sqrt{5}$

G.  $\frac{18 + \sqrt{5}}{31}$

H.  $\frac{18 + 3\sqrt{5}}{31}$

J.  $6 + \sqrt{5}$

11. Simplify:  $(-4x^3y^4)(-2x^3y^2)$

A.  $8x^9y^8$

B.  $-8x^3y^2$

C.  $8x^6y^6$

D.  $-8x^6y^6$

12. Simplify:  $(2x^2y^2)(-6x^2y^4)$

F.  $12x^2y^4$

G.  $-12x^4y^6$

H.  $-12x^4y^9$

J.  $12x^4y^6$

**HINTS AND NOTES****PRACTICE All.1b**

13. Simplify:  $\frac{-27x^7y^3}{-9x^4y^6}$

A.  $\frac{x^3}{3y^3}$

B.  $\frac{3x^3}{y^3}$

C.  $-\frac{3x^3}{y^3}$

D.  $\frac{3x^{11}}{y^9}$

14. Simplify:  $\frac{32x^7y^2}{-8xy^7}$

F.  $\frac{4x^6}{y^5}$

G.  $-\frac{4x^6}{y^5}$

H.  $-\frac{x^6}{4y^5}$

J.  $-\frac{4x^8}{y^9}$

**SOL AII.1c**

The student, given rational, radical, or polynomial expressions, will write radical expressions as expressions containing rational exponents and vice versa.

**HINTS and NOTES**

Don't Forget:  $\sqrt[b]{x^a} = (\sqrt[b]{x})^a = x^{a/b}$

**PRACTICE AII.1c**

1. Rewrite  $(\sqrt[6]{x})^5$  using rational exponents.
  - A.  $x^{6/5}$
  - B.  $x^{-6/5}$
  - C.  $x^{5/6}$
  - D.  $x^{-5/6}$
2. Rewrite  $\sqrt[8]{x^7}$  using rational exponents
  - F.  $x^{-8/7}$
  - G.  $x^{7/8}$
  - H.  $x^{-7/8}$
  - J.  $x^{8/7}$
3. Simplify and write in simplest radical form:  
 $x^{5/2} \cdot x^{1/5}$ 
  - A.  $\sqrt{x}$
  - B.  $x^{210}\sqrt{x^7}$
  - C.  $x^2$
  - D.  $\sqrt[27]{x^{10}}$
4. Simplify and write in simplest radical form:  
 $x^{1/2} \cdot x^{5/3}$ 
  - F.  $x^2\sqrt[6]{x}$
  - G.  $\sqrt[13]{x^6}$
  - H.  $\sqrt[6]{x^5}$
  - J.  $x^5\sqrt{x}$





**SOL AII.1d**

The student, given rational, radical, or polynomial expressions, will factor polynomials completely.

**HINTS and NOTES**Ways to Factor:

- 1) Greatest Common Factor

$$xy + xw = x(y + w)$$

- 2) Difference of Squares

$$a^2 - b^2 = (a - b)(a + b)$$

- 3) Sum of Cubes\*

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

- 4) Difference of Cubes\*

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

\*  $(a$  [same sign]  $b)(a^2$  [opposite sign]  $ab$  [always positive]  $b^2)$

- 5) Trinomials

- 6) Factor by Grouping (leading coefficient) – four terms

- 7) Completing the square

**PRACTICE AII.1d**

1. Which is the factored form of  $64x^3 + 1$ ?

- A.  $(4x + 1)(4x^2 + 4x + 1)$
- B.  $(4x + 1)(16x^2 + 1)$
- C.  $(4x + 1)(16x^2 - 4x + 1)$
- D.  $(4x + 1)(16x^2 + 4x + 1)$

2. Factor:  $x^2 - 100$

- F.  $(x - 50)(x + 50)$
- G.  $(x - 10)(x - 10)$
- H.  $(x - 10)(x + 10)$
- J.  $(x - 25)(x - 4)$

3. Factor:  $9x^6 - 21x^9$

- A.  $3(3x^6 - 7x^9)$
- B.  $3x^5(3x - 7x^8)$
- C.  $3x^6(3 - 7x^3)$
- D.  $x^6(9 - 21x^3)$

4. Factor:  $2x^2 - 7x - 4$

- F.  $(2x - 1)(x + 4)$
- G.  $(2x + 4)(x - 1)$
- H.  $(2x + 1)(x - 4)$
- J.  $(2x - 1)(x - 4)$

**PRACTICE All.1d**

5. Factor:  $x^2 + 3x + 2$

- A.  $(x-1)(x-2)$
- B.  $(x+1)(x+2)$
- C.  $(x-1)(x+2)$
- D.  $(x+3)(x+2)$

6. Factor:  $18u^2 + 3u - 1$

- F.  $(6u+1)(3u-1)$
- G.  $(6u-1)(3u-1)$
- H.  $(6u+1)(3u+1)$
- J.  $(6u-1)(3u+1)$

7.  $2x^2 + 5x - 12$  represents the area of a rectangle. Which of the following could represent the length of one side of the rectangle?

- A.  $2x+3$
- B.  $2x-3$
- C.  $x-4$
- D.  $x+12$

8.  $3x^2 - 5x + 2$  represents the area of a rectangle. Which of the following could represent the length of one side of the rectangle?

- F.  $3x+2$
- G.  $x+1$
- H.  $3x-2$
- J.  $x-2$

9. Factor:  $b^3 - 64$

- A.  $(b-4)^3$
- B.  $(b-4)(b-4)(b-4)$
- C.  $(b-4)(b^2 + 4b + 16)$
- D.  $(b-4)(b^2 - 4b + 16)$

10. Find the term that must be added to both sides of the equation so that the equation can be solved by the method of completing the square  $x^2 + 8x = 13$ .

- F. 16
- G. 64
- H. -13
- J. 32

11. Find the term that must be added to both sides of the equation so that the equation can be solved by the method of completing the square  $x^2 + 6x = 9$ .

- A. 18
- B. 9
- C. 36
- D. -9

## AII.2

The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve real-world problems, including writing the first  $n$  terms, finding the  $n^{\text{th}}$  term, and evaluating summation formulas. Notation will include  $\Sigma$  and  $a_n$ .

### HINTS and NOTES

#### Term Formulas

A:  $a_n = a_1 + (n-1)d$

G:  $a_n = a_1 \cdot r^{n-1}$

#### Sum Formulas

A:  $S = \frac{n(a_1 + a_n)}{2}$

G:  $S = \frac{a_1(1-r^n)}{1-r}$

IG:  $S = \frac{a_1}{1-r}$

If you forget the formulas, just list series out and count terms or add terms on calculator.

### PRACTICE AII.2

1. Insert two arithmetic means between -2 and 13.  
A. 1, 10  
B. 3, 8  
C. 2, 9  
D. 4, 7
2. Evaluate:  $\sum_{n=1}^{25} (3n + 2)$   
F. 984  
G. 1000  
H. 1025  
J. 2050
3. Which is an arithmetic sequence?  
A. 2, 5, 9, 14...  
B. 100, 50, 12.5, 1.6...  
C. 3, 10, 17, 24...  
D. -8, -4, -2, -1...
4. If  $a_n = 3(2)n$  which of the following represents  $a_3$ ?  
F. 12  
G. 18  
H. 24  
J. 27
5. Which of the following represents  $\sum_{n=2}^8 (3n - 2)$ ?  
A. 26  
B. 69  
C. 91  
D. 92
6. Find the next term in the sequence 8, 5, 2, -1.  
F. -2  
G. -3  
H. -4  
J. -5

**SOL AII.3**

The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of  $i$ , and identify field properties that are valid for the complex numbers.

**HINTS and NOTES****Calculator (TI-83 or TI-84)**

Use  $i$  button on the calculator, however remember to use the parentheses to separate operations.

EX.  $\frac{2+i}{3-i}$

$$(2+i) \div (3-i) =$$

Don't Forget:  $i^2 = -1$

**PRACTICE AII.3**

1. Simplify:  $\frac{3-4i}{-2+i}$

A.  $-2+i$

B.  $-2$

C.  $\frac{-2+11i}{3}$

D.  $\frac{-2+5i}{3}$

2. Simplify:  $\frac{3-5i}{7+4i}$

F.  $\frac{1}{65} - \frac{47}{65}i$

G.  $\frac{1}{65} + \frac{47}{65}i$

H.  $-\frac{1}{65} + \frac{47}{65}i$

J.  $-\frac{1}{65} - \frac{47}{65}i$

3. Simplify:  $\frac{7+i}{8+i}$

A.  $\frac{-57-i}{65}$

B.  $\frac{57-i}{65}$

C.  $\frac{-57+i}{65}$

D.  $\frac{57+i}{65}$

## HINTS and NOTES

## PRACTICE AII.3

4. Simplify:  $(-2-5i)(8+3i)$

F.  $-31-46i$

G.  $-1+34i$

H.  $-31+34i$

J.  $-1-46i$

5. Simplify:  $(1+7i)(-9-4i)$

A.  $-37+59i$

B.  $19+59i$

C.  $19-67i$

D.  $-37-67i$

6. Simplify:  $(3+8i)+(7-6i)$

F.  $10-2i$

G.  $10+2i$

H.  $69+38i$

J.  $-4+14i$

7. Simplify:  $(6-6i)-(1-2i)$

A.  $7-8i$

B.  $7+8i$

C.  $-6-18i$

D.  $5-4i$

8. Simplify:  $(3+4i)+2(5i-6)$

F.  $-24+13i$

G.  $-9+14i$

H.  $-18+14i$

J.  $5i$

## HINTS and NOTES

To simplify powers of  $i$

Change to  $(i^2)^{\text{Power}}$  then change

$(i^2)$  to  $(-1)$

### Example

$$\begin{aligned} i^{23} &= (i^2)^{11} \cdot i \\ &= (-1)^{11} \cdot i \\ &= (-1) \cdot i \\ &= -i \end{aligned}$$

Don't Forget:  $\sqrt{-1} = i$

## PRACTICE AII.3

9. Simplify:  $i^{44}$

- A. 1
- B.  $-1$
- C.  $i$
- D.  $-i$

10. Simplify:  $i^{27}$

- F. 1
- G.  $i$
- H.  $-i$
- J.  $-1$

11. Write the given expression in terms of  $i$ :  $\sqrt{-8}$ .

- A.  $-8i$
- B.  $-2\sqrt{2}i$
- C.  $i\sqrt{8}$
- D.  $2i\sqrt{2}$

12. Write the given expression in terms of  $i$ :  $\sqrt{-64}$ .

- F.  $-8$
- G.  $-8i$
- H.  $8i$
- J. 8

**SOL AII.4a**

The student will solve, algebraically and graphically, absolute value equations and inequalities.

Graphing calculators will be used for solving and for confirming the algebraic solutions.

**HINTS and NOTES****To Solve Absolute Value Equations**

Set = to positive value

Set = to negative value

**To Solve Absolute Value Inequalities**

1. Write equation as is

2. Write equation, switch inequality symbol, change to negative value

**To Graph Absolute Value Inequalities**

Great**OR** Than

Less Th**AND**

**OR....**

$| | >$  (Open – Left & Right)

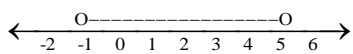
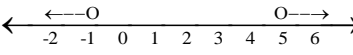
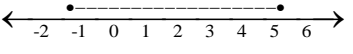
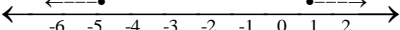
$| | \geq$  (Closed – Left & Right)

$| | <$  (Open – Between)

$| | \leq$  (Closed – Between)

**PRACTICE AII.4a**

1. Which graph represents the solution of  $|3x - 6| > 9$ ?

- A. 
- B. 
- C. 
- D. 

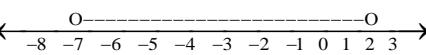
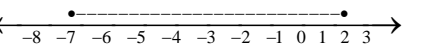
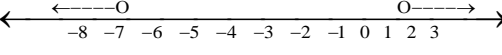
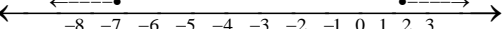
2. Solve:  $2|x - 2| = 4$

- F.  $x = 0$  and  $x = 4$
- G.  $x = 4$
- H.  $x = 0$
- J. no solution

3. Solve:  $|4x + 1| = 5$

- A.  $-\frac{3}{2}, 1$
- B.  $\frac{5}{2}, \frac{3}{2}$
- C.  $-\frac{3}{2}, \frac{3}{2}$
- D.  $-\frac{3}{2}, -1$

4. Solve and Graph:  $|2x + 5| < 9$

- F. 
- G. 
- H. 
- J. 

**SOL AII.4b**

The student will solve, algebraically and graphically, quadratic equations over the set of complex numbers;

Graphing calculators will be used for solving and for confirming the algebraic solutions.

**HINTS and NOTES****Methods for Solving Quadratics**

1. Factor
2. Complete the Square
3. Square Root Method
4. Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\sqrt{\text{negative number}}$  use  $i$

**Calculator Hints:**

To Find Roots, Solutions, Zeros

1. Graph quadratic in  $y =$
2. Press  $2^{\text{nd}}$  Trace
3. Press #2 for zeros
4. Left Enter
5. Right Enter
6. (Guess) Enter

**PRACTICE AII.4b**

1. Solve:  $3x^2 + 4x - 4 = 0$

- A.  $\frac{2}{3}, -2$
- B.  $-\frac{2}{3}, 2$
- C.  $4, -12$
- D.  $2, -3$

2. Solve:  $3x^2 + 14 = 8$

- F.  $2, -2$
- G.  $2i, -2i$
- H.  $\sqrt{2}, -\sqrt{2}$
- J.  $i\sqrt{2}, -i\sqrt{2}$

3. Solve:  $x^2 - x - 2 = 0$

- A.  $-1, 2$
- B.  $1, 2$
- C.  $-2, 1$
- D.  $-1, -2$

4. Solve:  $2(x-1)^2 = 8$

- F.  $3, -1$
- G.  $2, -2$
- H.  $1 + \sqrt{2}, 1 - \sqrt{2}$
- J. No Solution



## HINTS and NOTES

## PRACTICE All.4b

5. Solve:  $4x^2 + 13x - 12 = 0$

A.  $-4, \frac{4}{3}$

B.  $-4, \frac{3}{4}$

C.  $4, -\frac{3}{4}$

D.  $4, -\frac{4}{3}$

6. Solve:  $x^2 - 3x - 10 = 0$

F.  $5, 2$

G.  $-2, 5$

H.  $-5, 2$

J.  $-5, -2$

7. Solve:  $6x = -2x^2 + 3$

A.  $\frac{-3 \pm \sqrt{15}}{2}$

B.  $\frac{-3 \pm i\sqrt{3}}{2}$

C.  $\frac{3 \pm \sqrt{15}}{2}$

D.  $\frac{-3 \pm \sqrt{3}}{2}$

8. Which statement is true for the quadratic  
 $0 = -2x^2 + 4x + 48$  ?

F. The product of the roots is 24.

G. The product of the roots is  $-24$ .

H. The sum of the roots is  $-24$ .

J. The sum of the roots is  $-2$ .

### **HINTS and NOTES**

#### **Describe nature of roots**

1. You can graph the quadratic in the calculator look for the number of times the graph touches the x-axis.

Touches once – One real solution

Touches twice – Two real solutions

Does not touch – Two Imaginary solutions

2. Use the discriminant

$$b^2 - 4ac$$

Discriminant  $> 0 \rightarrow$   
Two real solutions

Discriminant  $< 0 \rightarrow$   
Two imaginary solutions

Discriminant  $= 0 \rightarrow$   
One real solution

### **PRACTICE All.4b**

9. Find the quadratic equation with roots  $-3$  and  $-\frac{2}{5}$ .

- A.  $5x^2 - 17x + 6 = 0$
- B.  $5x^2 + 17x - 6 = 0$
- C.  $5x^2 - 17x - 6 = 0$
- D.  $5x^2 + 17x + 6 = 0$

10. Find the quadratic equation with roots  $-1$  and  $\frac{5}{3}$ .

- F.  $3x^2 - 2x - 5 = 0$
- G.  $3x^2 + 2x - 5 = 0$
- H.  $3x^2 + 2x + 5 = 0$
- J.  $3x^2 - 2x + 5 = 0$

11. Describe the nature of the roots of the equation  $3x^2 - 2x - 2 = 0$ .

- A. One real root
- B. Two imaginary roots
- C. One real root and one imaginary root
- D. Two real roots

12. Describe the nature of the roots of the equation  $4x^2 + 4x + 5 = 0$ .

- F. Two imaginary roots
- G. Two real roots
- H. One real root
- J. One real root and one imaginary root

**SOL All.4c**

The student will solve, algebraically and graphically, equations and inequalities;  
expressions;

Graphing calculators will be used for solving and for communicating.

**HINTS and NOTES****Solve a rational equation**

1. Determine the least common denominator.
2. Eliminate the fraction(s) by multiplying ALL terms by the least common denominator.
3. Simplify the terms.
4. Solve the resulting equation.
5. Check your answers to make sure the solution does not make the fraction undefined.

**PRACTICE All.4c**

1. Solve:  $\frac{3}{x-4} = \frac{-2}{x-2}$

A.  $x = \frac{8}{5}$

B.  $x = 2$

C.  $x = \frac{14}{5}$

D.  $x = \frac{14}{3}$

2. Solve:  $\frac{m-3}{m+6} = \frac{m+9}{m-2}$

F.  $m = -\frac{12}{5}$

G.  $m = -\frac{15}{2}$

H.  $m = -3$

J.  $m = \frac{15}{2}$

3. Solve:  $\frac{5}{3x} - \frac{4}{x} = 2$

A.  $x = \frac{5}{6}$

B.  $x = -\frac{7}{2}$

C.  $x = -\frac{6}{7}$

D.  $x = -\frac{7}{6}$

**PRACTICE AII.4c**

4. Solve:  $\frac{a}{a^2-25} + \frac{3}{a-5} = \frac{5}{a+5}$

F.  $a = 5$

G.  $a = 40$

H.  $a = -40$

J.  $a = 0$

5. Solve:  $\frac{5}{x+4} - \frac{2}{2-x} = \frac{7}{x^2+2x-8}$

A.  $x = \frac{13}{3}$

B.  $x = \frac{5}{7}$

C.  $x = \frac{9}{7}$

D.  $x = \frac{25}{3}$

**SOL AII.4d**

The student will solve, algebraically and graphically, equations containing radical expressions.

Graphing calculators will be used for solving and for confirming the algebraic solutions.

**HINTS and NOTES****Solve a radical equation**

Isolate the radical

Square or cube both sides

**PRACTICE AII.4d**

1. Solve:  $2 - y = \sqrt{y + 4}$

- A.  $y = 0$
- B.  $y = 5$
- C.  $y = 0$  and  $y = 5$
- D. no solution

2. Solve:  $\sqrt{x + 9} + 3 = x$

- F.  $x = -7$
- G.  $x = 7$
- H.  $x = -7$  and  $x = 7$
- J.  $x = 0$  and  $x = 7$

3. Solve:  $\sqrt[3]{4x - 1} = 3$

- A.  $x = 7$
- B.  $x = \sqrt[3]{7}$
- C.  $x = -\frac{13}{7}$
- D.  $x = 7$  and  $x = -\frac{13}{2}$

## SOL AII.5

The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. Graphing calculators will be used as a tool to visualize graphs and predict the number of solutions.

### HINTS and NOTES

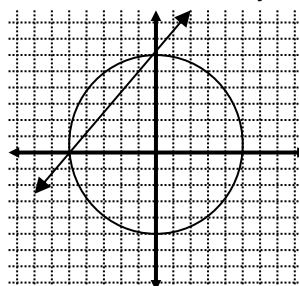
#### Number of solutions

Number of points of intersection on graph

### PRACTICE AII.5

1. How many solutions are there for this system?

- A. 0
- B. 1
- C. 2
- D. 3

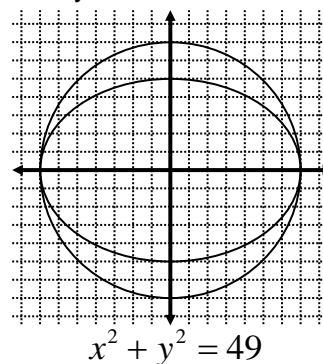


2. Solve:  $x^2 + y^2 = 41$   
 $y = 3x - 7$

- F.  $(-4, -4)$
- G.  $(4, 5)$
- H.  $(5, 8)$
- J.  $(-4, -19)$

3. Which is the solution to the system below?

- A.  $\{(0, -7), (0, 7)\}$
- B.  $\emptyset$
- C.  $\{(-7, 0), (7, 0)\}$
- D.  $\{(0, -5), (0, 5)\}$



4. Solve the system graphically:  $\frac{x^2}{64} + \frac{y^2}{81} = 1$

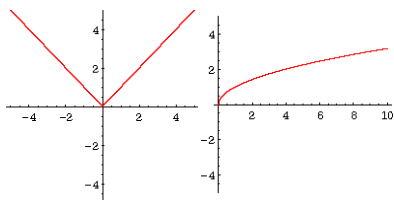
- F.  $\{(0, -8), (0, 8)\}$
- G.  $\{(0, -9), (0, 9)\}$
- H.  $\emptyset$
- J.  $\{(-8, 0), (8, 0)\}$

## SOL AII.6

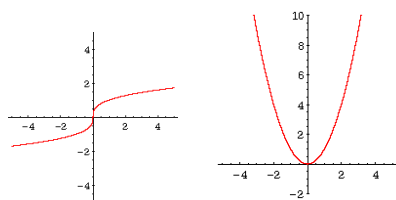
The student will recognize the general shape of function (absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.

### HINTS and NOTES

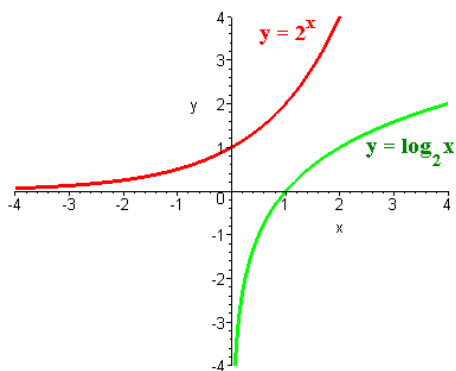
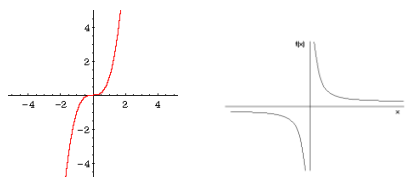
$$y = |x| \quad y = \sqrt{x}$$



$$y = \sqrt[3]{x} \quad y = x^2$$



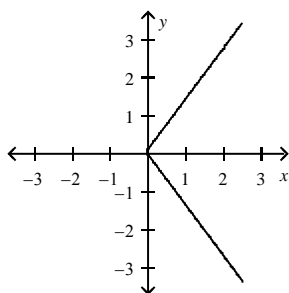
$$y = x^3 \quad y = \frac{1}{x}$$



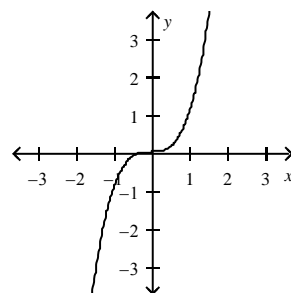
### PRACTICE AII.6

1. Which of the following is the graph of a quadratic?

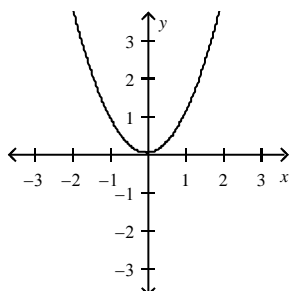
A.



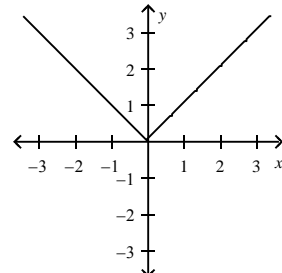
B.



C.

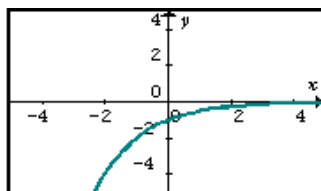


D.

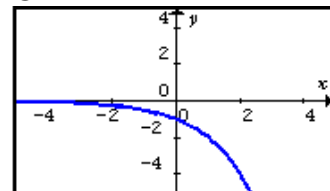


2. Which of the following could represent  $y = 2^x$ ?

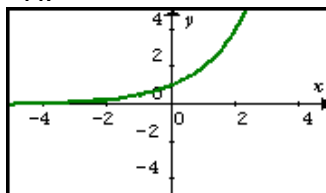
F.



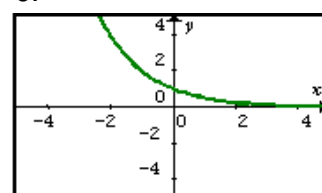
G.



H.



J.



## HINTS and NOTES

For the functions below,  
use these rules to translate  
the graph:

$h > 0$  shifts right  $h$  units

$h < 0$  shifts left  $h$  units

$k > 0$  shifts up  $k$  units

$k < 0$  shifts down  $k$  units

$a < 0$  reflects across  $x$  axis

change  $x$  to  $-x$ , reflects  
across  $y$  axis

$$y = a|x - h| + k$$

$$y = a(x - h)^2 + k$$

$$y = a\sqrt{x - h} + k$$

$$y = a^3\sqrt[3]{x - h} + k$$

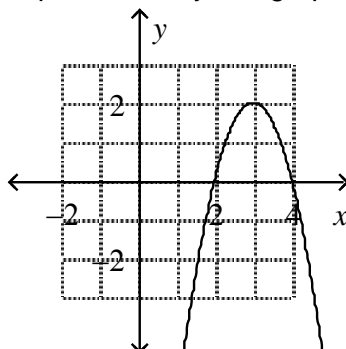
$$y = ab^{x-h} + k$$

$$y = \log_b(x - h) + k$$

$$y = \frac{a}{x - h} + k$$

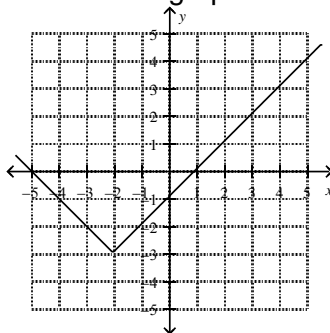
## PRACTICE AII.6

3. Which of the following is most likely the equation represented by this graph?



- A.  $y = -2(x + 3)^2 - 2$
- B.  $y = -2(x - 3)^2 + 2$
- C.  $y = 2(x - 3)^2 + 2$
- D.  $y = -2(x + 3)^2 + 2$

4. Given the graph:



Write an equation for it using a translation of  $y = |x|$ .

F.  $y = |x - 3| + 2$

G.  $y = |x + 3| + 2$

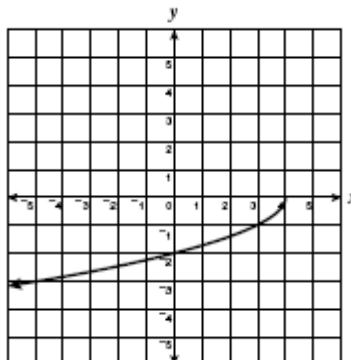
H.  $y = |x - 2| - 3$

J.  $y = |x + 2| - 3$



## PRACTICE AII.6

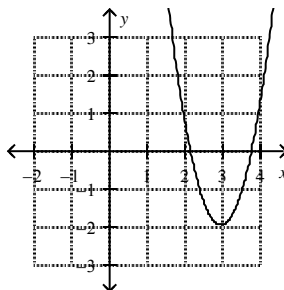
5. Which most likely represents the equation of the graph below?



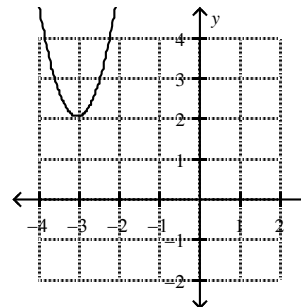
- A.  $y = \sqrt{4 - x}$
- B.  $y = -\sqrt{4 - x}$
- C.  $y = -\sqrt{4 + x}$
- D.  $y = \sqrt{4 + x}$

6. What could be the graph of  $y + 2 = 3(x + 3)^2$  ?

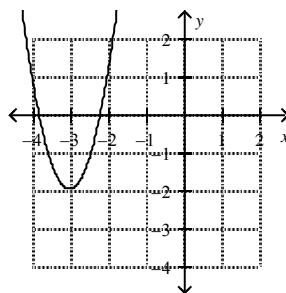
F.



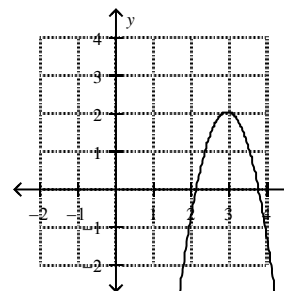
G.



H.



J.



**SOL AII.7a**

The student will investigate and analyze functions algebraically and graphically. Key concepts include domain and range, including limited and discontinuous domains and ranges. Graphing calculators will be used as a tool to assist in investigation of functions.

**HINTS and NOTES**

domain:  $x$  values

range:  $y$  values

Eliminate values in domain and range when:

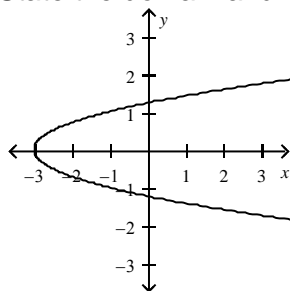
- division by zero
- radicand (number under radical) is negative

**PRACTICE AII.7a**

1. If the domain of  $f(x) = 2x^2 - 3$  is limited to  $\{-3, -1, 1, 3\}$ , what is the range?

- A.  $\{-21, -5, -1, 15\}$
- B.  $\{-21, 15\}$
- C.  $\{-1, 15\}$
- D.  $\{1, 5, 15, 21\}$

2. State the domain and range of this graph:



- F. Domain:  $\{\mathbb{R}\}$ , Range:  $\{y \geq 3\}$
- G. Domain:  $\{x \geq 3\}$ , Range:  $\{\mathbb{R}\}$
- H. Domain:  $\{x > -3 \text{ and } x < 3\}$ , Range:  $\{\mathbb{R}\}$
- J. Domain:  $\{\mathbb{R}\}$ , Range:  $\{y \leq 3\}$

3. Find the domain of  $y = \frac{x^2 + x - 2}{x^2 - x - 2}$ .

- A. all real numbers except  $x = 2$  and  $x = -1$
- B. all real numbers except  $x = 2$  and  $x = 1$
- C. all real numbers except  $x = -2$  and  $x = 1$
- D. all real numbers except  $x = -2$  and  $x = -1$

4. Find the domain of  $f(x) = \frac{x-2}{x^2+9}$ .

- F. all real numbers except  $x = 2$
- G. all real numbers except  $x = 3$  and  $x = -3$
- H. all real numbers except  $x = -3$
- J. all real numbers

**SOL AII.7b**

The student will investigate and analyze functions algebraically and graphically. Key concepts include zeros.

Graphing calculators will be used as a tool to assist in investigation of functions.

**HINTS and NOTES****Zeros**

- when  $f(x) = 0$
- when graph crosses or touches the x axis
- number of complex zeros =  $n$  (degree of polynomial)
- number of real zeros  $\leq n$  (degree of polynomial)
- factor polynomial to find zeros

**PRACTICE AII.7b**

1. What are the zeros of  $f(x) = 2x^2 + 5x - 3$ ?  
A.  $-3$  and  $\frac{1}{2}$   
B.  $-\frac{1}{2}$  and  $3$   
C.  $-3$  and  $2$   
D.  $2$  and  $3$
2. Which is a zero of the function  $f(x) = -x - 6$ ?  
F.  $0$   
G.  $1$   
H.  $6$   
J.  $-6$
3. Find all the real zeros of the function.  
 $y = 7x^4 - 56x^3 + 84x^2$   
A.  $0, 2, 6$   
B.  $0, 2$   
C.  $0, 2, 7$   
D.  $2, 6$

## SOL AII.7c

The student will investigate and analyze functions algebraically and graphically. Key concepts include x- and y- intercepts.

Graphing calculators will be used as a tool to assist in investigation of functions.

### HINTS and NOTES

#### x and y intercepts

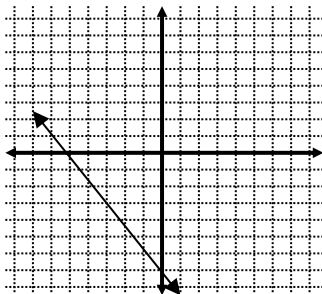
To find the x-intercept,  
plug in zero for y.

To find the y-intercept,  
plug in zero for x.

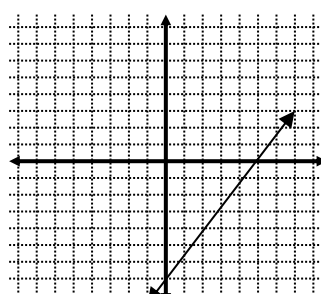
### PRACTICE AII.7c

1. Graph  $7x + 5y = 35$  by determining its x- and y-intercepts.

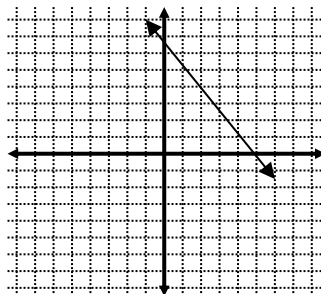
A.



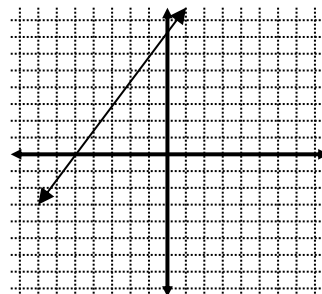
B.



C.

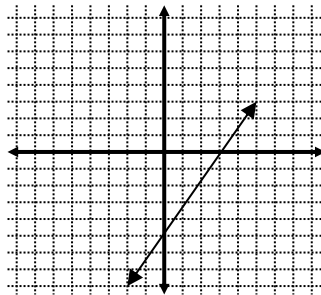


D.

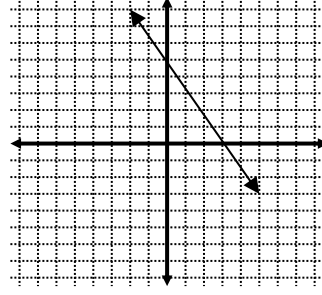


2. Graph  $5x + 3y = 15$  by determining its x- and y-intercepts.

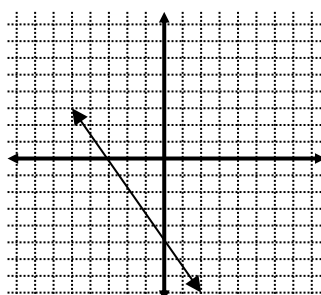
F.



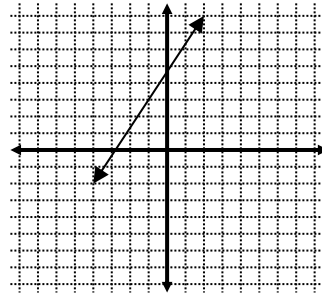
G.



H.



J.



## SOL AII.7d

The student will investigate and analyze functions algebraically and graphically. Key concepts include intervals in which a function is increasing or decreasing. Graphing calculators will be used as a tool to assist in investigation of functions.

### HINTS and NOTES

#### **Increasing Function -**

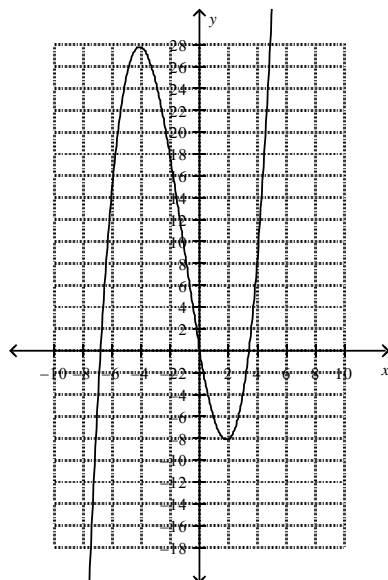
**y-value** increases as the  
**x-value** increases  
(left to right)

#### **Decreasing Function -**

**y-value** decreases as the  
**x-value** increases  
(left to right)

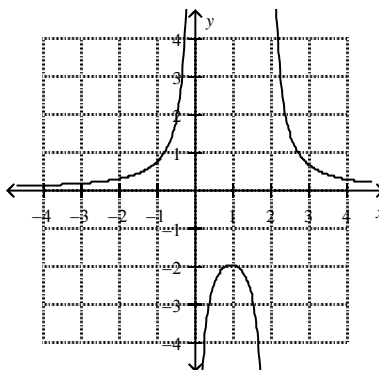
### Practice AII.7d

1. For what values of  $x$  is this function increasing?



- A.  $(-4, 2)$
- B.  $(2, \infty)$
- C.  $(-\infty, -4)$  and  $(2, \infty)$
- D.  $(-\infty, 2)$

2. For what intervals is this function decreasing?



- F.  $(0, 1)$  and  $(1, 2)$
- G.  $(-\infty, 0)$  and  $((1, 2)$
- H.  $(-\infty, 0)$  and  $(2, \infty)$
- J.  $(1, 2)$  and  $(2, \infty)$

## SOL All.7e

The student will investigate and analyze functions algebraically and graphically. Key concepts include asymptotes.

Graphing calculators will be used as a tool to assist in investigation of functions.

### HINTS and NOTES

#### Vertical Asymptotes

Possible to have multiple vertical asymptotes

Vertical asymptotes are when the denominator = 0

Factor denominator

#### Horizontal Asymptotes

One or no horizontal asymptote

#### TEST

#### Horiz Asy

degree numerator <  
degree denominator

$y=0$

degree num =  
degree denom

$y = \frac{\text{leading coeff num}}{\text{leading coeff denom}}$

degree num >  
degree denom

none  
(may have slant asymptote)

### Practice All.7e

1. What are the vertical asymptote(s) for the

function  $f(x) = \frac{5}{2x^2 - x - 1}$  ?

- A.  $x = -1, x = \frac{1}{2}$
- B.  $x = -\frac{1}{2}, x = 1$
- C.  $x = 1$
- D.  $x = -1, x = 1$

2. What is the horizontal asymptote for the

function  $f(x) = \frac{5}{2x^2 - x - 1}$  ?

- F.  $y = 0$
- G.  $y = \frac{5}{2}$
- H.  $y = \frac{1}{2}$
- J. none

3. Which of the following functions will have a horizontal asymptote at  $y = 3$ ?

- A.  $y = \frac{x-3}{x-1}$
- B.  $y = \frac{3x-2}{x+1}$
- C.  $y = \frac{3x^2-1}{x+2}$
- D.  $y = \frac{3x-2}{x^2+1}$

**SOL AII.7f**

The student will investigate and analyze functions algebraically and graphically. Key concepts include end behavior.

Graphing calculators will be used as a tool to assist in investigation of functions.

**HINTS and NOTES****End Behavior**

Use term with highest exponent

+ coefficient   - coefficient

Even degree     $\uparrow \uparrow$                    $\downarrow \downarrow$

Odd degree      $\downarrow \uparrow$                    $\uparrow \downarrow$

**PRACTICE AII.7f**

1. Determine the end behavior of the graph of

$$f(x) = 3x^4 - 3x^3 - 2x^2 + 1$$

- A. Down to the left, Up to the right
- B. Up to the left, Down to the right
- C. Up to the left, Up to the right
- D. Down to the left, Down to the right

2. Determine the end behavior of the graph of

$$f(x) = 4x^5 - 6x^2 + 5$$

- F. Down to the left, Up to the right
- G. Up to the left, Down to the right
- H. Up to the left, Up to the right
- J. Down to the left, Down to the right

3. Determine the end behavior of the graph of

$$f(x) = -3x^6 - 4x^3 + 2x - 1$$

- A. Down to the left, Up to the right
- B. Up to the left, Down to the right
- C. Up to the left, Up to the right
- D. Down to the left, Down to the right

4. Determine the end behavior of the graph of

$$f(x) = -4x^5 + 7x^3 - 2x + 5$$

- F. Down to the left, Up to the right
- G. Up to the left, Down to the right
- H. Up to the left, Up to the right
- J. Down to the left, Down to the right

**SOL AII.7g**

The student will investigate and analyze functions algebraically and graphically. Key concepts include inverse of a function.

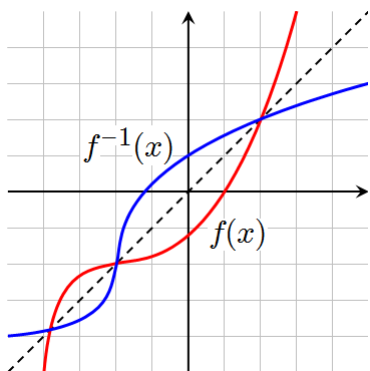
Graphing calculators will be used as a tool to assist in investigation of functions.

**HINTS and NOTES**

To find an inverse

- 1) Switch  $x$  and  $y$
- 2) Solve for  $y$

Graph of inverse function  $f^{-1}(x)$  is reflection of  $f(x)$  across the graph  $y = x$ .

**PRACTICE AII.7g**

1. If  $f(x) = \frac{x+4}{2}$ , find the inverse of  $f(x)$ .

A.  $f^{-1}(x) = 2x + 4$

B.  $f^{-1}(x) = \frac{2}{x+4}$

C.  $f^{-1}(x) = 2x - 4$

D.  $f^{-1}(x) = \frac{1}{2}x + 2$

2. Find the inverse given the function

$$f(x) = 5x^3 - 9.$$

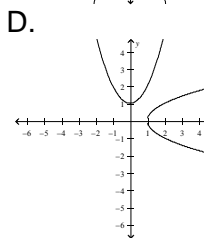
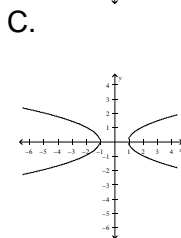
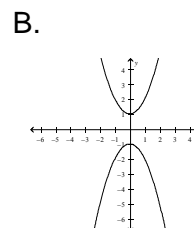
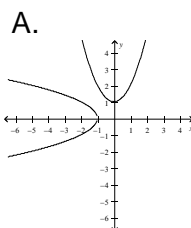
F.  $\frac{1}{5x^3 - 9}$

G.  $\sqrt[3]{\frac{x+9}{5}}$

H.  $\frac{(x+9)^3}{125}$

J.  $5x^{-1} - 9$

3. Which graph represents a function and its inverse?





## HINTS and NOTES

### Logarithmic and Exponential Equations

Exponential and logarithmic functions are inverses of each other.

$$y = a^x$$

is the equivalent of

$$\log_a y = x$$

### Log rules

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^n) = n \cdot \log_a x$$

### Change of Base Formula

$$\log_x y = \frac{\log y}{\log x}$$

## PRACTICE All.7g

4. Use the graphing calculator to evaluate  $\log 5.198$ .  
F. 5.198  
G. 1.648  
H. 51.98  
J. .716
5. Use the graphing calculator to evaluate  $\log_3 7$ .  
A. .368  
B. 1.771  
C. 3.34  
D. -.368
6. Evaluate  $\log_3 9$ .  
F.  $\frac{1}{3}$   
G. 2  
H.  $\frac{1}{2}$   
J.  $\sqrt[3]{9}$
7. Solve  $4^{2x} = 1$ .  
A.  $x = 0$   
B.  $x = 1$   
C.  $x = 1.137$   
D.  $x = 0.457$
8. Solve  $3^{x-1} = 12$ .  
F.  $x = 2.262$   
G.  $x = -1.112$   
H.  $x = 2.386$   
J.  $x = 3.262$
9. Solve  $\log_5(2x) = 3$ .  
A. 7.5  
B. 37.5  
C. 62.5  
D. 122.5
10. Solve for  $x$ :  $\log(5-x) - \log(2x+1) = 1$   
F.  $\frac{21}{4}$   
G.  $-\frac{5}{21}$   
H.  $\frac{4}{3}$   
J. 1

**SOL All.7h**

The student will investigate and analyze functions algebraically and graphically. Key concepts include composition of multiple functions.

Graphing calculators will be used as a tool to assist in investigation of functions.

**HINTS and NOTES****Composite Functions**

**$f(g(x))$  is equivalent to  $(f \circ g)(x)$**

**To find  $f(g(x))$ :**

Substitute the entire expression for  $g(x)$  into all of the  $x$ 's in the expression for  $f(x)$ .

**Practice All.7h**

1. If  $h(z) = 2z^2 + 1$  and  $k(z) = z - 5$ , which is correct?

- A.  $[h \circ k](z) = 2z^2 - 20z + 51$   
 B.  $[h \circ k](z) = 2z^2 - 4$   
 C.  $[h \circ k](z) = 2z^2 - 9z - 5$   
 D.  $[h \circ k](z) = 2z^3 - 10z^2 + z - 5$

2. If  $f(x) = 4x + 5$  and  $g(x) = -x^2 - 1$ , which is the value of  $g[f(-3)]$ ?

- F. -35  
 G. 48  
 H. -200  
 J. -50

3. Find  $[g \circ h](x)$  and  $[h \circ g](x)$ .

$$g(x) = 7x$$

$$h(x) = -9x - 11$$

- A.  $[g \circ h](x) = -63x^2 - 77x$   
 $[h \circ g](x) = -63x^2 - 11x$   
 B.  $[g \circ h](x) = -63x - 77$   
 $[h \circ g](x) = -63x - 11$   
 C.  $[g \circ h](x) = -63x - 77$   
 $[h \circ g](x) = -63x - 77$   
 D.  $[g \circ h](x) = -63x + 77$   
 $[h \circ g](x) = -63x + 11$

4. Find  $[g \circ h](x)$ .

$$g(x) = 12x$$

$$h(x) = -10x^3 + 6x^2 - 11x + 1$$

- F.  $[g \circ h](x) = -120x^4 + 72x^3 - 132x^2 + 12x$   
 G.  $[g \circ h](x) = -17280x^3 + 864x^2 - 132x + 1$   
 H.  $[g \circ h](x) = 120x^3 + 72x^2 - 132x + 12$   
 J.  $[g \circ h](x) = -120x^3 + 72x^2 - 132x + 12$

## SOL AII.8

The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

### HINTS and NOTES

#### Equivalent statements:

- $k$  is a zero of the polynomial function
- $(x-k)$  is a factor of  $f(x)$
- $k$  is a solution of the polynomial equation  $f(x)=0$
- $k$  is an  $x$ -intercept for the graph  $y = f(x)$

#### Possible Rational Roots

$$\frac{\text{factors of } p \text{ (constant term)}}{\text{factors of } q \text{ (leading coefficient)}}$$

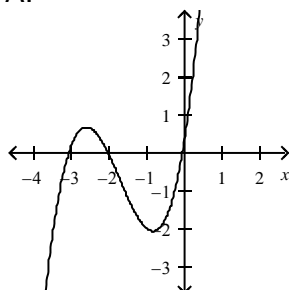
#### Descartes Rule of Signs

- gives number and sign of real roots
- number of sign changes in  $f(x)$  is number of positive real roots or is less than the number by multiple of 2
- number of sign changes in  $f(-x)$  is number of negative real roots or is less than the number by multiple of 2

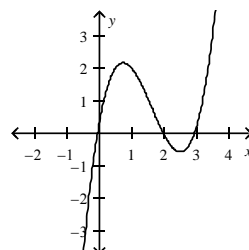
### PRACTICE AII.8

1. Which could be the graph of  $f(x) = x(x-3)(-2)$  ?

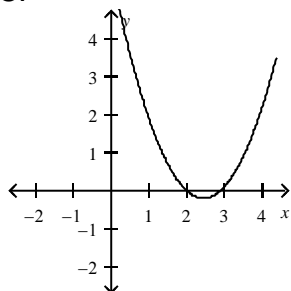
A.



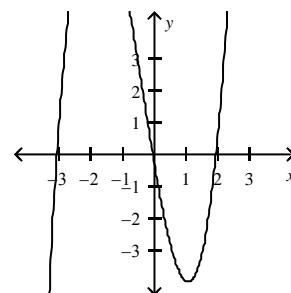
B.



C.



D.



2. Name the possible rational roots of

$$f(x) = 7x^4 - 21x^3 - 371x^2 - 63x$$

F.  $\pm \frac{1}{7}, \frac{3}{7}, 1, 3, 7, 9, 21, 63$

G.  $\pm 1, 3, 7, 9, 21, 63$

H.  $\pm \frac{1}{7}, \frac{3}{7}, \frac{9}{7}$

J.  $\pm \frac{1}{7}, \frac{3}{7}, 1, \frac{9}{7}, 3, 7, 9, 21, 63$

3. Determine consecutive values of  $x$  between which each real zero is located for  $f(x) = -9x^4 - 7x^3 - 17x^2 + 20x + 18$

A. There are zeros between  $x=1$  and  $x=2$ ,  $x=0$  and  $x=-1$ .

B. There are zeros between  $x=0$  and  $x=-1$ .

C. There are zeros between  $x=0$  and  $x=1$ .

D. There are zeros between  $x=2$  and  $x=3$ ,  $x=-1$  and  $x=0$ ,  $x=-2$  and  $x=-3$ .

## HINTS and NOTES

### Imaginary roots

must be conjugate pairs

$(a + bi)$   $(a - bi)$

## PRACTICE AII.8

4. Give the possible number of imaginary roots for:

$$f(x) = -15x^4 + 3x^3 + 10x^2 - 10x - 15.$$

- F. 5
- G. 4
- H. 3
- J. 2

5. Find the roots of  $2x^3 + 2x^2 - 19x + 20 = 0$ .

- A.  $\frac{3+i}{2}, \frac{3-i}{2}, -4$
- B.  $\frac{-3+2i}{2}, \frac{-3-2i}{2}, 4$
- C.  $\frac{-3+i}{2}, \frac{-3-i}{2}, -4$
- D.  $\frac{3+2i}{2}, \frac{3-2i}{2}, 4$

6. Write a polynomial function with zeros at -5, -3 and 3.

- F.  $f(x) = x^3 + 5x^2 - 9x - 45$
- G.  $f(x) = x^3 + 5x^2 - 9x + 12$
- H.  $f(x) = x^3 - 45x^2 + 5x - 9$
- J.  $f(x) = x^3 - 4x^2 - 360x + 12$

7. Find all of the zeros of  $f(x) = 11x^3 - 59x^2 + 104x - 60$ .

- A. 1.36, 2, 2
- B. -1.36, -2
- C. -1.36, -2, 2
- D. -1.36, 2

8. A polynomial equation with rational coefficients has the roots  $5 + \sqrt{7}$ ,  $5 - \sqrt{7}$ . Find two additional roots.

- F.  $7 + \sqrt{5}$ ,  $2 - \sqrt{5}$
- G.  $7 - \sqrt{5}$ ,  $2 + \sqrt{5}$
- H.  $5 + \sqrt{7}$ ,  $5 - \sqrt{2}$
- J.  $5 - \sqrt{7}$ ,  $5 + \sqrt{2}$

## SOL AII.9

The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.

### HINTS and NOTES

  
Negative slope & correlation

  
Positive slope & correlation

### Line of best fit:

Look for slope & y-intercept

Calculator:

1. Put data into lists

Stat-edit-L<sub>1</sub>-L<sub>2</sub>

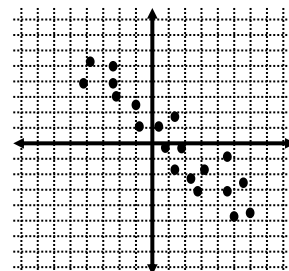
2. Stat-calc-4:Lin Reg-enter

3. Equation for line of best fit is  $y = ax + b$  and substitute the values given for a and b.

### PRACTICE AII.9

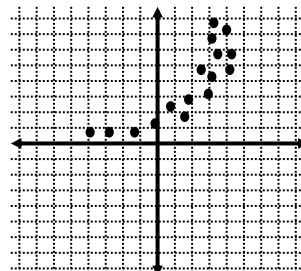
1. Determine the correlation for the scatter plot.

- A. Strong positive correlation.
- B. Strong negative correlation.
- C. No correlation
- D. Not enough information given.



2. Look at the given scatter plot. This data best fits what type of equation?

- F. Linear
- G. Exponential
- H. Logarithmic
- J. Quadratic



3. Which of the following equations represents the line of best fit for the following data?

X	23	26	26	33	34	44	44	45	64
Y	25	25	26	21	18	19	21	19	15

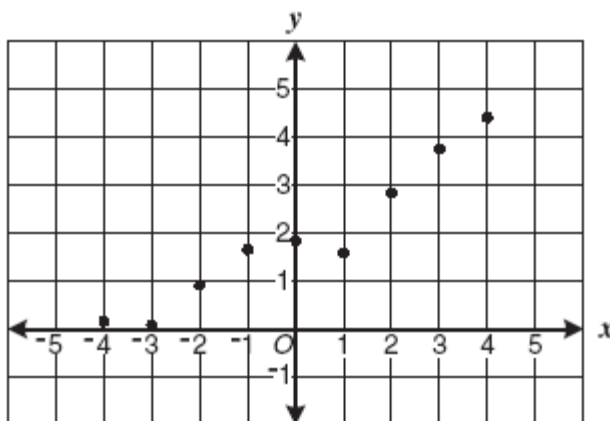
- A.  $y = 4.8x + 32$
- B.  $y = -0.25x - 30.4$
- C.  $y = -0.324x + 32.4$
- D.  $y = -3.24x - 32$

**PRACTICE AII.9**

4. The table shows the number of students enrolled in the Honors Algebra-Trig program at Menchville High School the first 5 years since its initiation. What is your prediction for the number of students in the *eighth* year?

Year (X)	Number of Students (Y)
1	55
2	71
3	84
4	97
5	108

- F. 119 students  
G. 124 students  
H. 141 students  
J. 149 students
5. Which is most likely the equation for the curve of best fit for the scatterplot below?



- A.  $y = x + 2$   
B.  $y = x - 3$   
C.  $y = \frac{1}{2}x + 2$   
D.  $y = \frac{1}{8}x + 4$

**SOL AII.10**

The student will identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations.

**HINTS and NOTES****Inverse Variation**

$y$  varies inversely with  $x$

$$y = \frac{k}{x} \quad k = y \bullet x$$

**Direct Variation**

$y$  varies directly with  $x$

$$y = kx \quad k = \frac{y}{x}$$

**Joint Variation**

$z$  varies jointly with  $x$  and  $y$

$$z = kxy \quad k = \frac{z}{xy}$$

**PRACTICE AII.10**

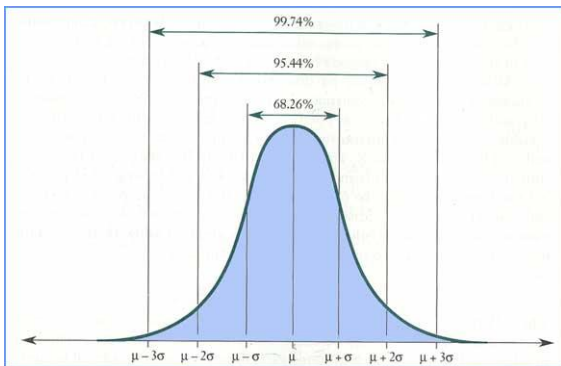
- The area ( $A$ ) of a circle varies directly as the square of the radius ( $r$ ). If  $k$  is the constant of proportionality, which is the formula for this relationship?
  - $A = \frac{k}{r^2}$
  - $A = kr$
  - $A = kr^2$
  - $r = kA^2$
- The frequency of a radio signal varies inversely as the wave length. A signal of frequency 1200 kilohertz (kHz), which might be the frequency of an AM radio station, has a wave length 250 m. What frequency has a signal wave length of 400m?
  - 83 kHz
  - 750 kHz
  - 1350 kHz
  - 1920 kHz
- Suppose that  $y$  varies jointly with  $w$  and  $x$  and inversely with  $z$ . Write the equation that models the relationship.
  - $y = \frac{z}{wx}$
  - $y = \frac{1}{wxz}$
  - $y = \frac{wx}{z}$
  - $y = \frac{z}{wx}$

## SOL AII.11

The student will identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard curve.

### HINTS and NOTES

#### Normal Distribution



#### Standard Normal Distribution

Mean =  $\mu = 0$

Standard Deviation =  $\sigma = 1$

#### z-score

$$z = \frac{x - \mu}{\sigma}$$

z-score reflects how many standard deviations it is above or below the mean

### PRACTICE AII.11

1. Grades on an Algebra test follow a normal distribution with a mean of 74 and a standard deviation of 12. Approximately what percentage of the students have scores below 50?  
A. 14%  
B. 34%  
C. 20%  
D. 3%
2. Grades on an Algebra test follow a normal distribution with a mean of 82 and a standard deviation of 8. How many of the 25 students scored above a 90%?  
A. 4 students  
B. 9 students  
C. 3 students  
D. not enough information
3. Susan scored a 28 on the math portion of the ACT which had a  $\mu=20$  and  $\sigma=5$ . She scored a 620 on the math portion of the SAT which had a  $\mu=500$  and a  $\sigma=80$ . Which test score has the higher percentile and what was that percentile?  
A. ACT, 94.5%  
B. SAT, 94.5%  
C. ACT, 98.4%  
D. SAT, 98.4%



## SOL AII.12

The student will compute and distinguish between permutations and combinations and use technology for applications.

### HINTS and NOTES

#### Fundamental Counting Principle

Event M can occur in  $m$  ways and event N can occur in  $n$  ways, then event M followed by event N can occur in  $m \cdot n$  ways.

#### Permutation

Number of ways to arrange items - **order matters.**

$${}_nP_r = \frac{n!}{(n-r)!}$$

#### Combination

Number of ways to arrange items - **order does not matter.**

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

#### Permutation > Combination

### PRACTICE ALGII.12

1. Mama Mia's Pizza offers three crust choices, twelve topping choices, and five cheese choices. If a customer can choose one crust choice, one topping, and one cheese choice, how many different pizzas are available?  
  
A. 20 pizzas  
B. 60 pizzas  
C. 36 pizzas  
D. 180 pizzas
2. How many different basketball teams of five players can be chosen from a team of sixteen players?  
  
F. 4,368 teams  
G. 524,160 teams  
H. 80 teams  
J. 16 teams
3. The Technology Club is electing officers. If there are to be four officers elected out of the thirty members, how many different possible election results are there?  
  
A. 27,405 outcomes  
B. 116,280 outcomes  
C. 657,720 outcomes  
D. 120 outcomes
4. How many different five card hands can be dealt from a standard deck of fifty-two cards?  
  
A. 2,598,960 hands  
B. 311,875,200 hands  
C. 260 hands  
D. 270,725 hands