Pre-Calculus Unit 5 – November 2nd to November 13th 2012
Graphing & Writing Secant, Cosecant, Tangent and Cotangent Functions

Date	Topic	Assignment	Did It
Fri 11/2	4.6 Graphing Secant and Cosecant **NOTES p.1 & 2**	Worksheet p. 3, 4 (#5 – 12)	
Mon 11/5	4.6 Graphing Tangent and Cotangent **NOTES p. 5**	Worksheet p. 6, 7 (#3 – 10)	
Tues 11/6	4.6 Graphing all 4: sec, csc, tan, cot	Worksheet – in class (8 problems) HW – Study for quiz	
Wed 11/7	4.6 Writing Equations: Sec, Csc, Tan, Cot **NOTES p. 8** **QUIZ: Graphing sec, csc, tan, cot**	Worksheet p. 8 & 9 (#5 – 12)	
Thur 11/8	4.7 Inverse Trig Functions **NOTES p. 10 & 11**	Worksheet p. 11	
Fri 11/9	Solving Equations: Calculator Trig **NOTES p. 12**	Worksheet p. 12	
Mon 11/12	Review for Test – work on review in class	Review Sheet – p. 13,14 HW – Study for Test	
Tues 11/13	**TEST – Unit 5**	**Print Unit 6 – Triangle Trig**	
Wed 11/14	**Sinusoidal Regression PROJECT DUE**		

NOTES: **Secant**

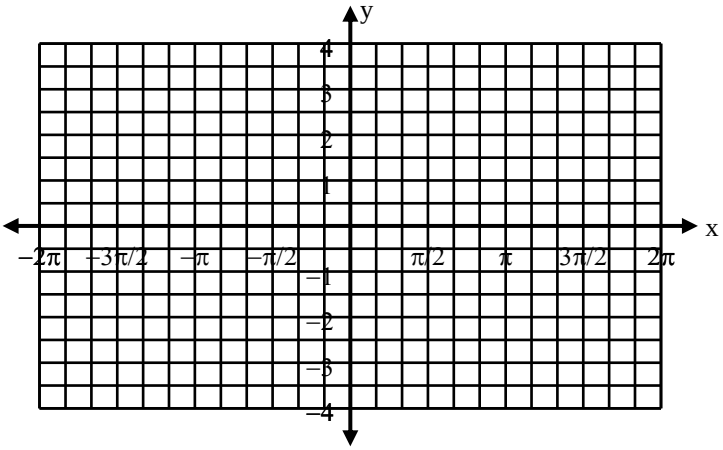
Parent equation: _____

Domain:_____ Period: _____

Range: _____

Equation of Asymptotes: _____

Two Specific Asymptotes:_____



Cosecant

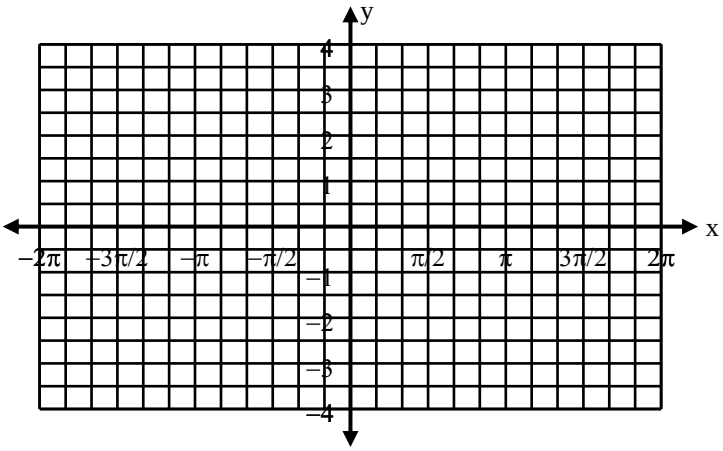
Parent equation: _____

Domain:_____ Period: _____

Range: _____

Equation of Asymptotes: _____

Two Specific Asymptotes:_____



TRANSFORMATIONS:

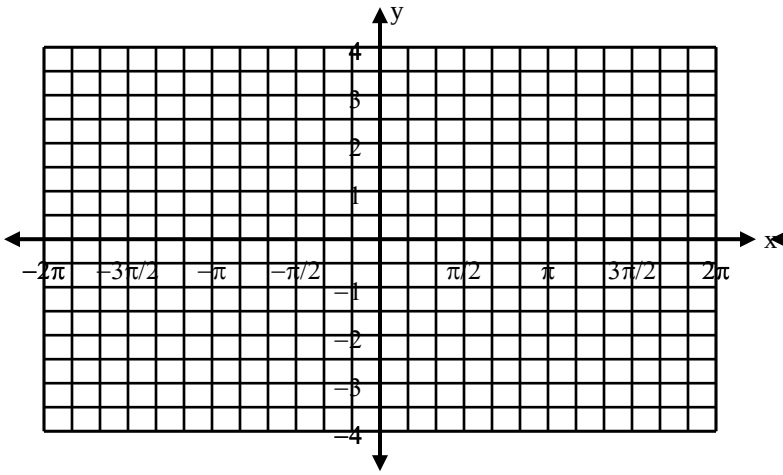
	Secant	Cosecant
General Equation	$y = a\sec b(\theta - c) + d$	$y = a\csc b(\theta - c) + d$
Period	$\frac{2\pi}{b}$	$\frac{2\pi}{b}$
To Find Domain and Asymptote Equation	$x = \frac{\frac{\pi}{2} + n\pi}{b} + c$	$x = \frac{n\pi}{b} + c$

1.) $y = \frac{1}{2}\sec 3\theta$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



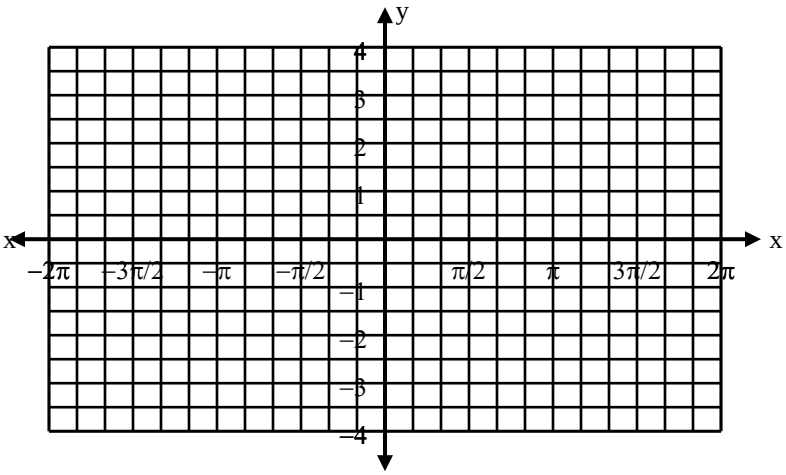
Domain: _____ Range: _____

2.) $y = 2\csc\theta - 1$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



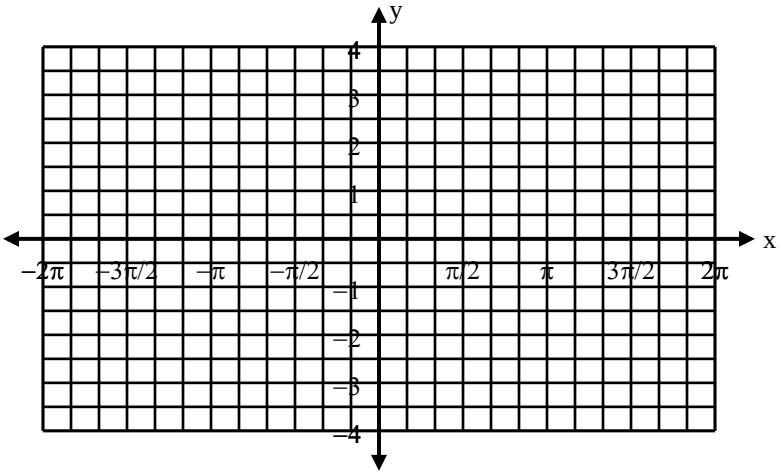
Domain: _____ Range: _____

3.) $y = \sec(\theta - \frac{\pi}{2})$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



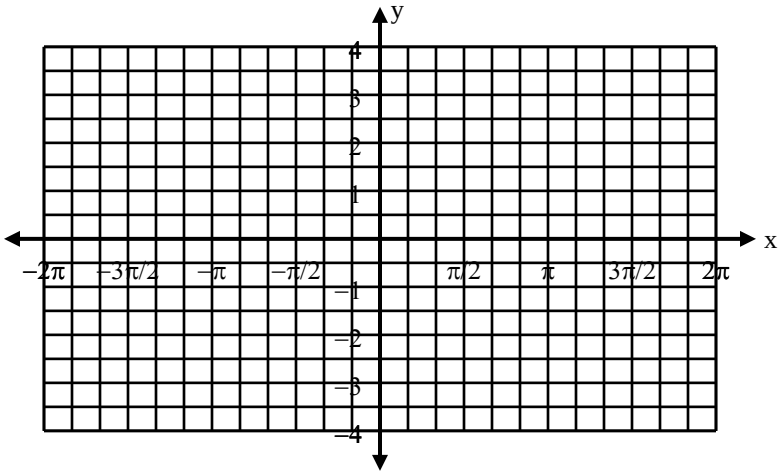
Domain: _____ Range: _____

4.) $y = \csc 2(\theta + \frac{\pi}{2})$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



Domain: _____ Range: _____

PreCalculus – Worksheet – Graphing Secant and Cosecant

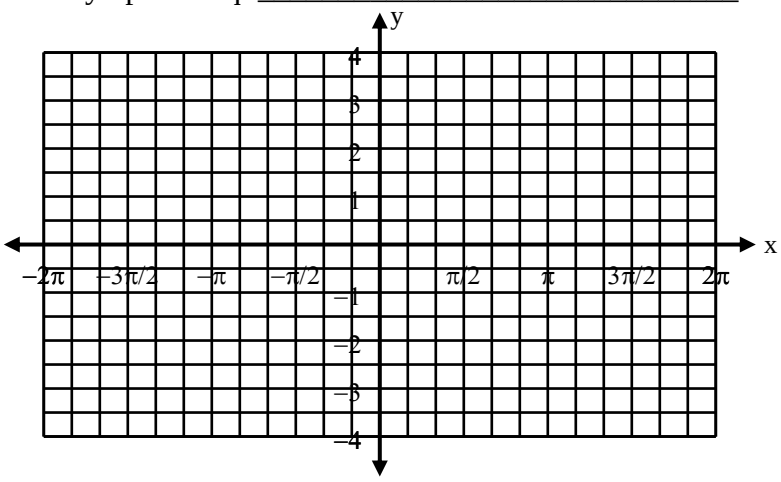
Sketch the graph. Determine b, the period, phase shift, vertical shift, 2 specific asymptotes, the asym equation, domain and range.

5.) $y = -2\csc\theta - 2$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



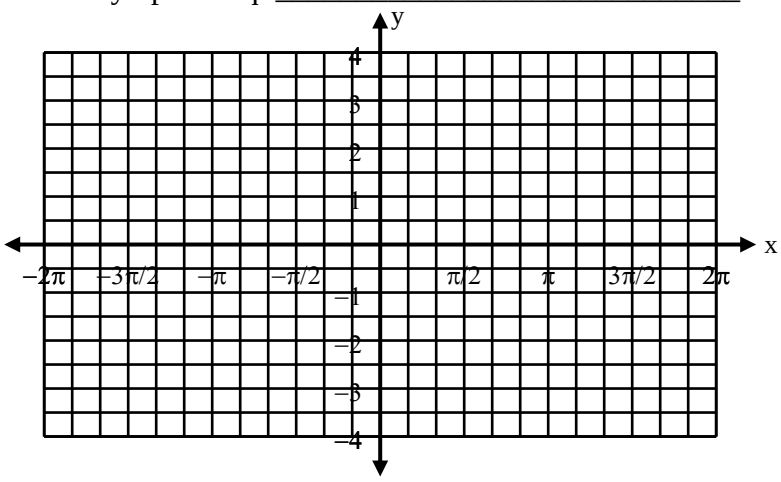
Domain: _____ Range: _____

6.) $y = \sec 2\theta + 2$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



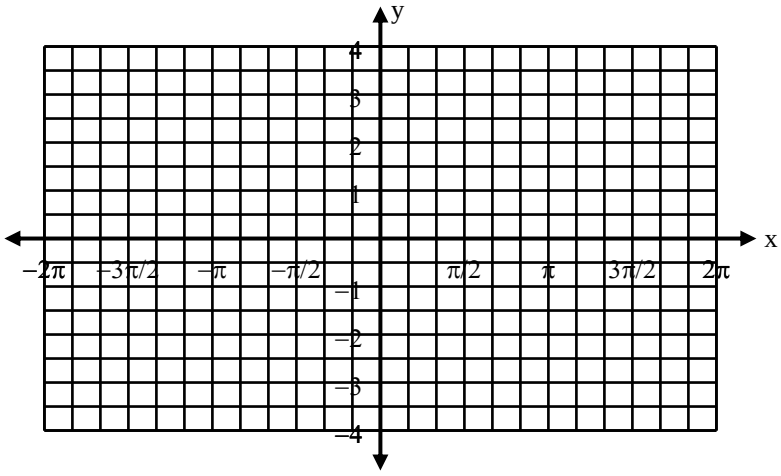
Domain: _____ Range: _____

7.) $y = -2\sec(\theta + \frac{\pi}{6})$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



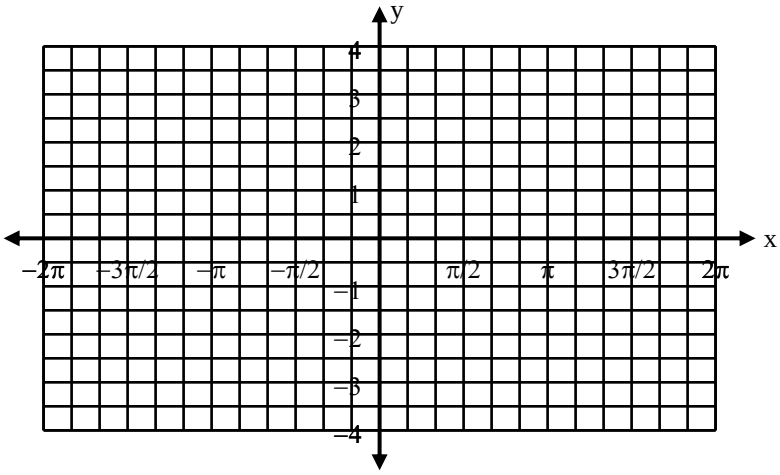
Domain: _____ Range: _____

8.) $y = \sec(\theta - \frac{\pi}{3}) - 2$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



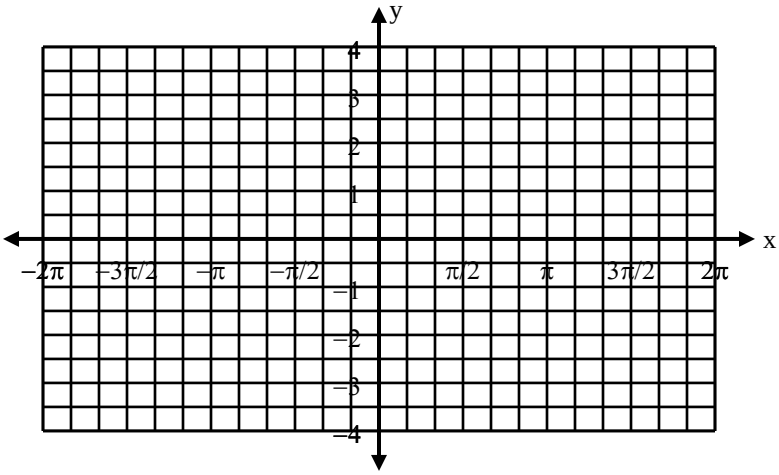
Domain: _____ Range: _____

9.) $y = \csc 2(\theta + \frac{\pi}{3})$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



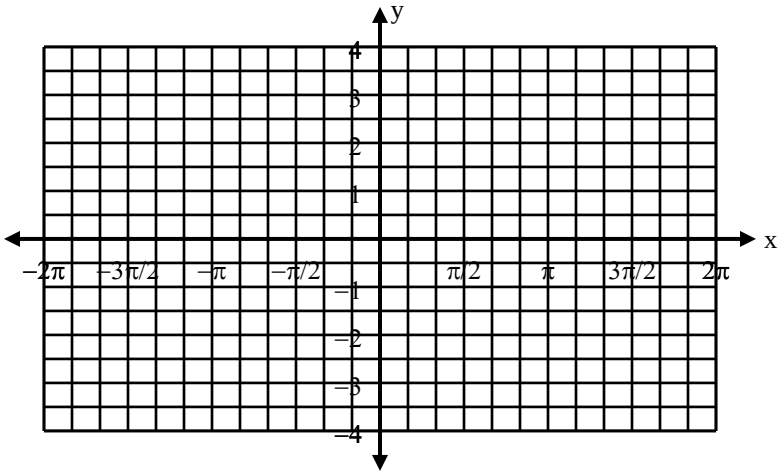
Domain: _____ Range: _____

10.) $y = -\sec \frac{1}{2}\theta$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



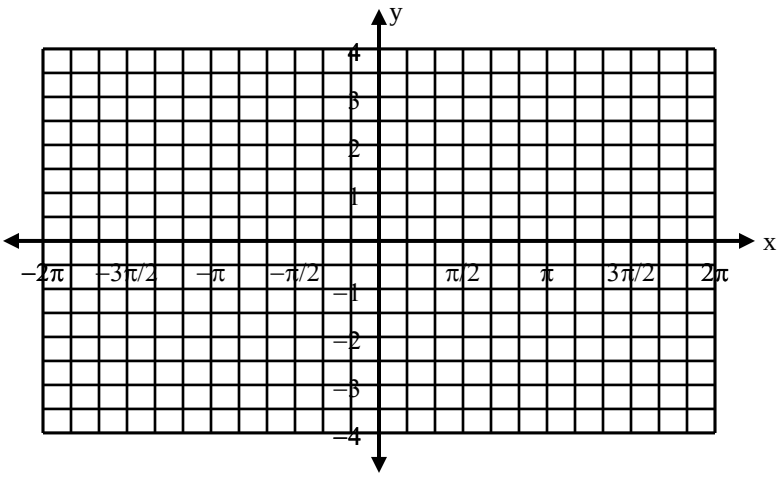
Domain: _____ Range: _____

11.) $y = 3\csc 3\theta$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



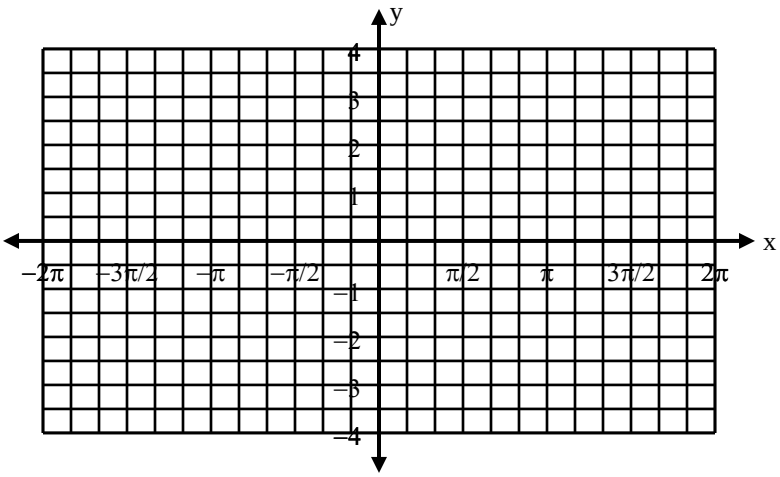
Domain: _____ Range: _____

12.) $y = -2\csc(\theta) + 2$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



Domain: _____ Range: _____

NOTES **Tangent**

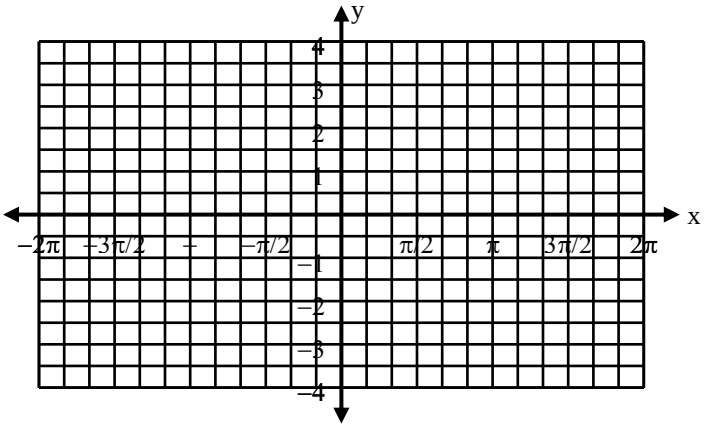
Parent equation: _____

Domain:_____

Range: _____ **Period:** _____

Equation of Asymptotes:_____

Two Specific Asymptotes:_____



Cotangent

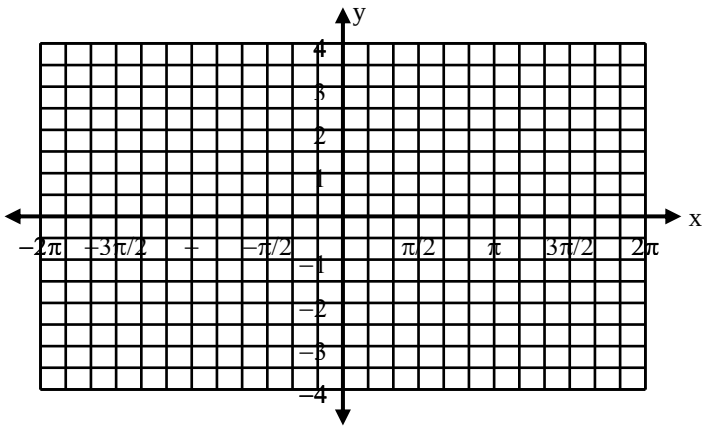
Parent equation: _____

Domain:_____

Range: _____ **Period:** _____

Equation of Asymptotes:_____

Two Specific Asymptotes:_____



TRANSFORMATIONS:

Tangent $y = a\tan b(\theta - c) + d$ Period = $\frac{\pi}{b}$ Domain/Asymptotes $x = \frac{\frac{\pi}{2} + n\pi}{b} + c$

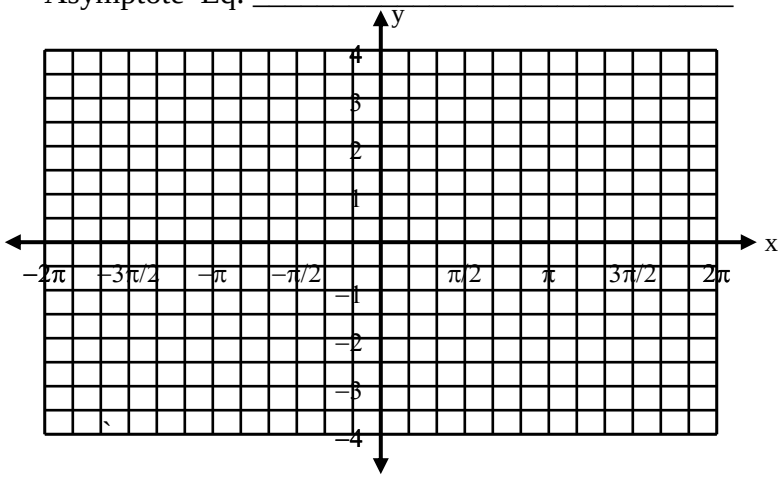
Cotangent $y = a\cot b(\theta - c) + d$ Period = $\frac{\pi}{b}$ Domain/Asymptotoes $x = \frac{n\pi}{b} + c$

1.) $y = 2\tan\theta - 1$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



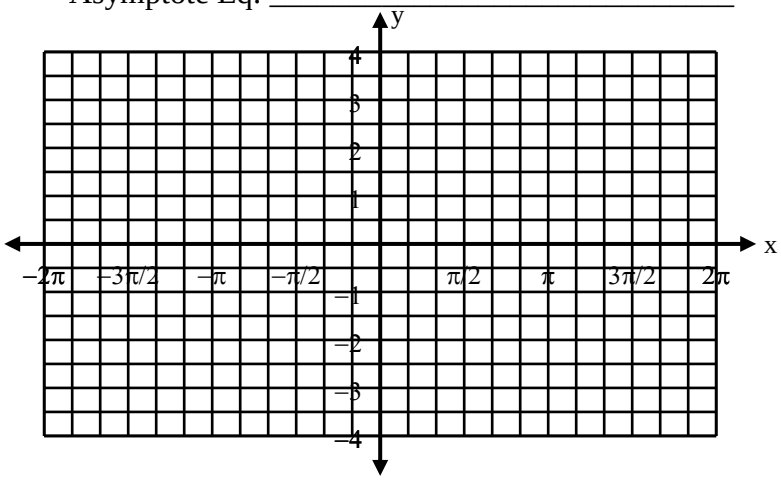
Domain: _____ Range: _____

2.) $y = \cot 2(\theta - \frac{\pi}{6})$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



Domain: _____ Range: _____

PreCalculus – Worksheet – Graphing Tangent and Cotangent

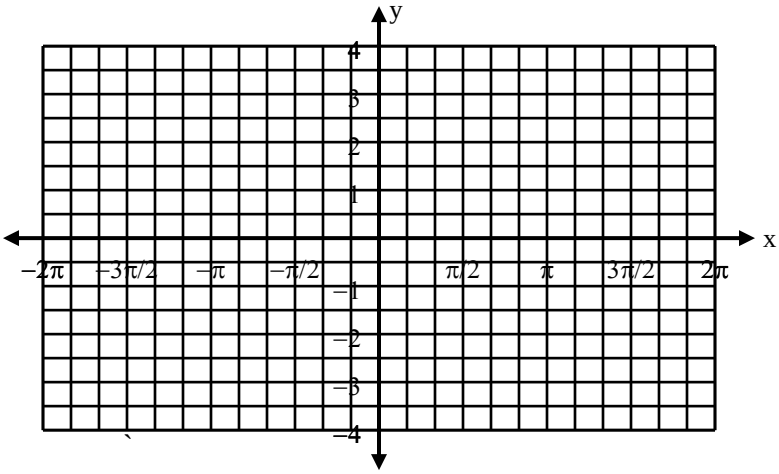
Sketch the graph. Determine b, the period, phase shift, vertical shift, 2 specific asymptotes, the asym equation, domain and range.

3.) $y = -\tan\theta$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



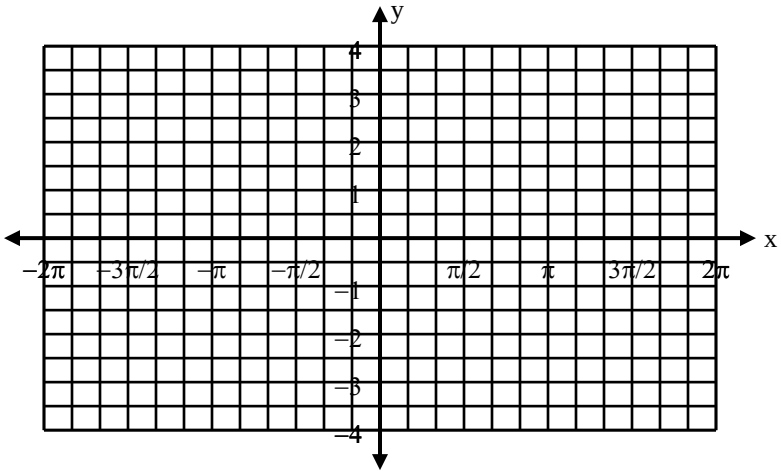
Domain: _____ Range: _____

4.) $y = \frac{1}{2}\cot\frac{1}{2}\theta$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



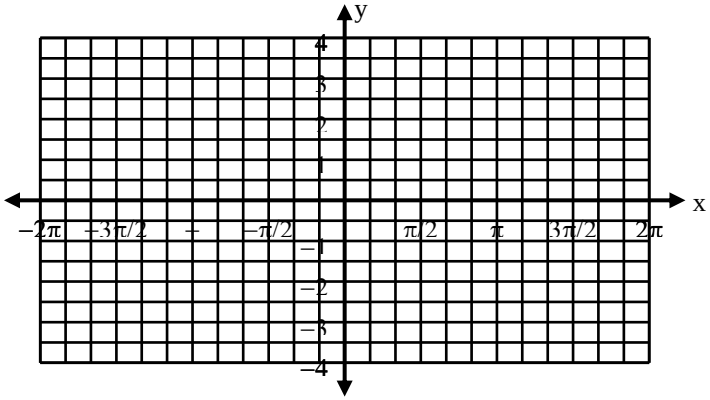
Domain: _____ Range: _____

5.) $y = \tan(\theta + \frac{2\pi}{3}) + 2$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



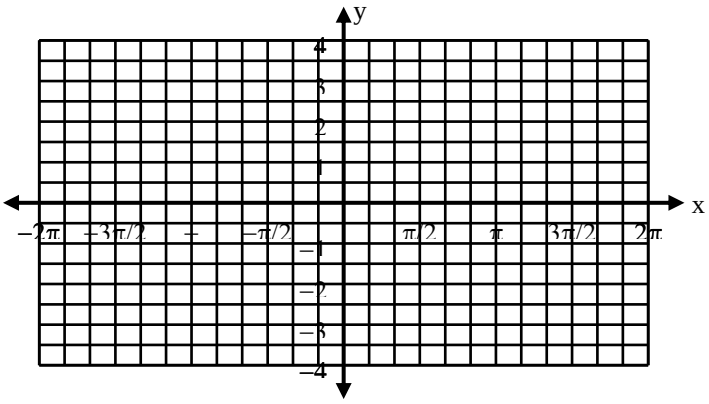
Domain: _____ Range: _____

6.) $y = -2\cot\theta$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



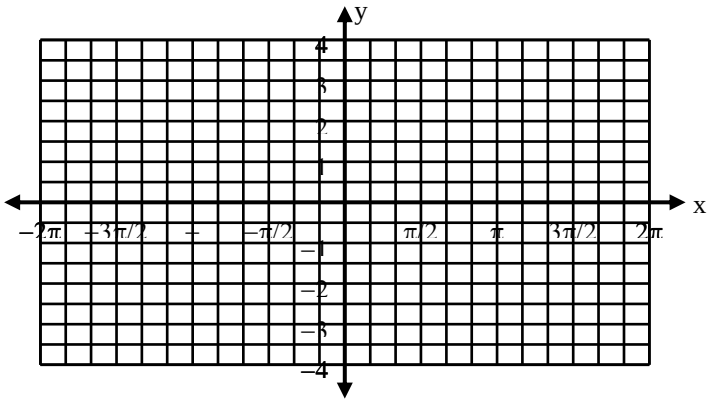
Domain: _____ Range: _____

7.) $y = \tan\frac{1}{2}(\theta - \frac{\pi}{2})$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



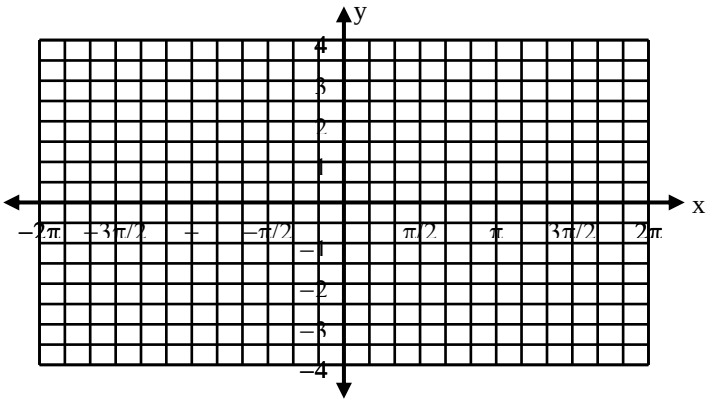
Domain: _____ Range: _____

8.) $y = 2\cot 2\theta - 2$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



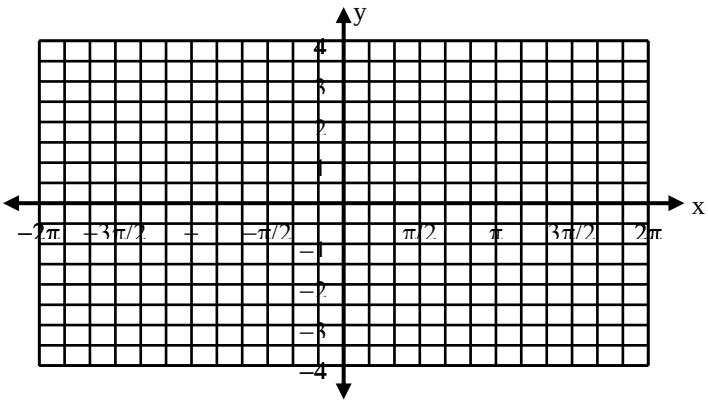
Domain: _____ Range: _____

9.) $y = -3\tan(\theta - \frac{\pi}{6})$

b = _____Period: _____ Phase Shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



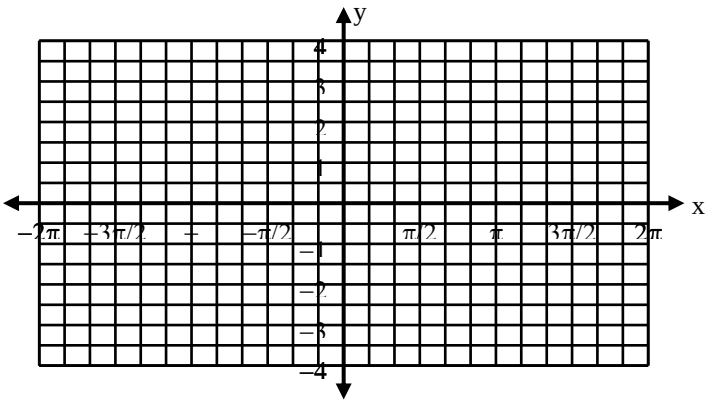
Domain: _____ Range: _____

10.) $y = 2\cot\frac{1}{2}\theta + 1$

b = _____ Period: _____Phase shift: _____

V. Shift: _____ 2 asym: _____

Asymptote Eq: _____



Domain: _____ Range: _____

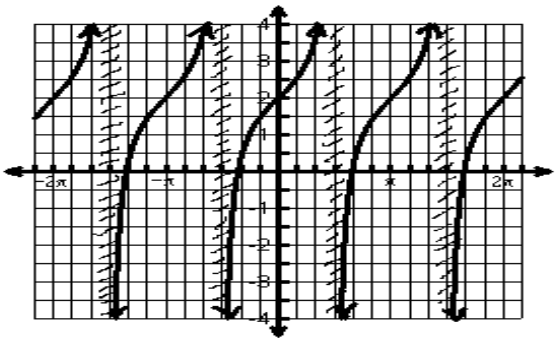
Writing Equations – Notes

1) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

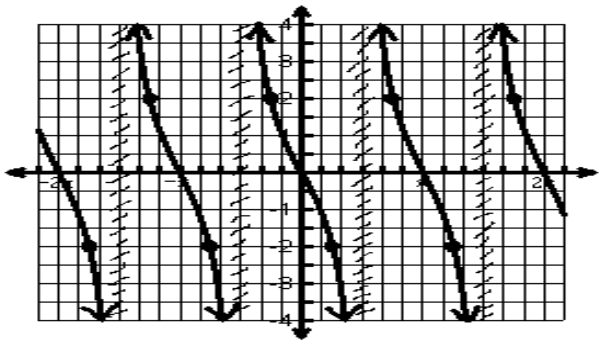


2) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

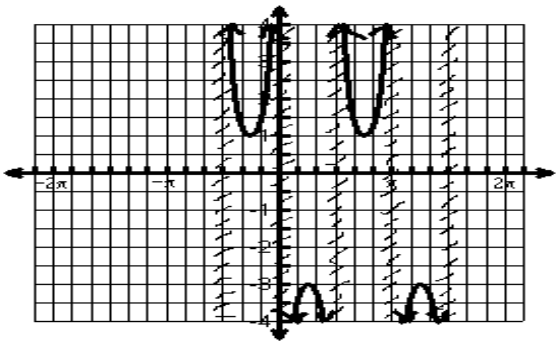


3) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

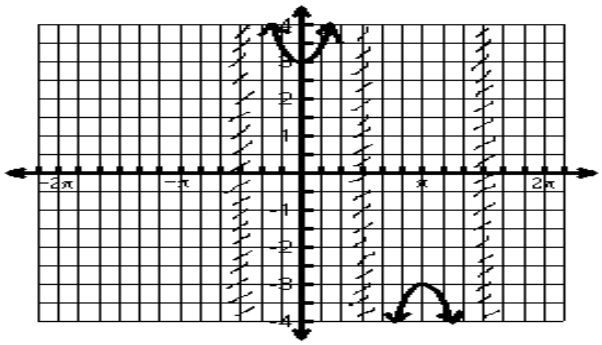


4) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____



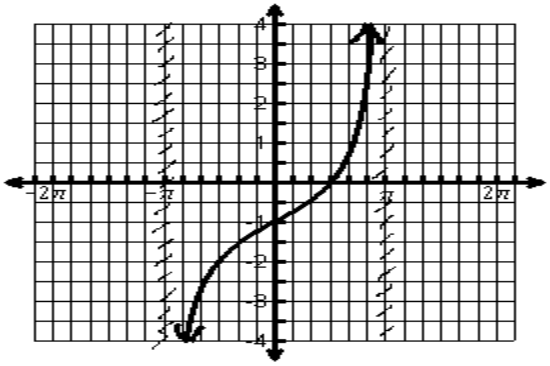
Writing Equations – Homework

5) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

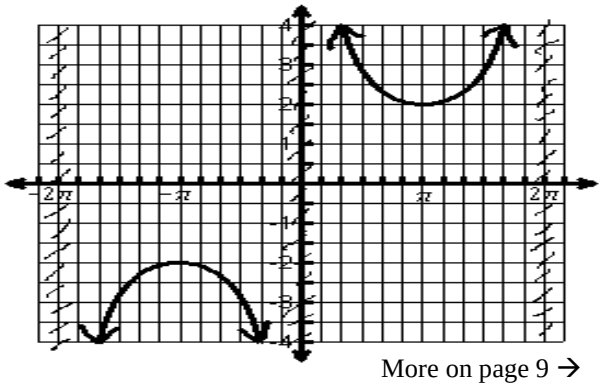


6) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____



More on page 9 →

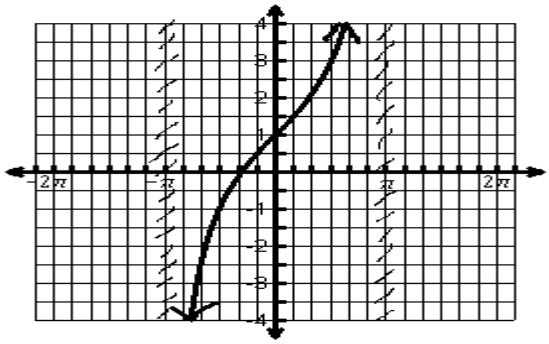
Writing Equations – Homework (cont'd)

7) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

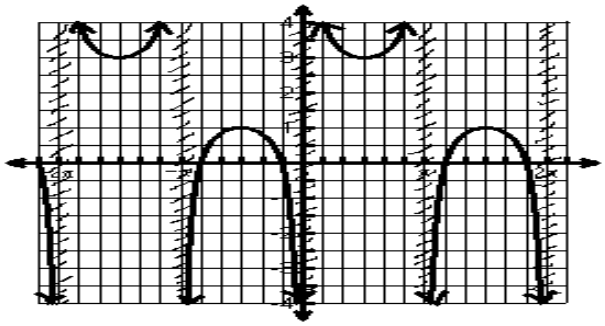


8) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

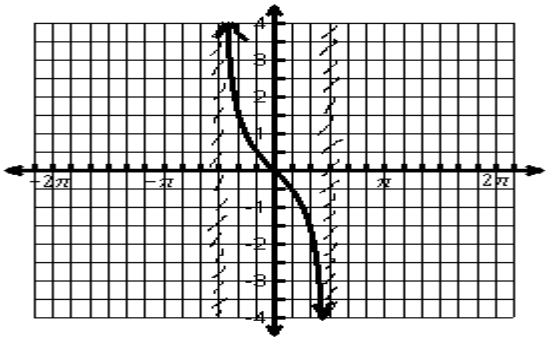


9) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

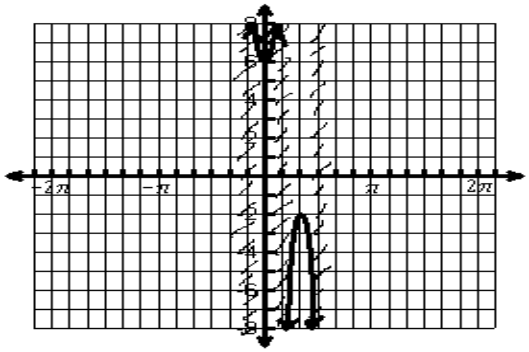


10) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

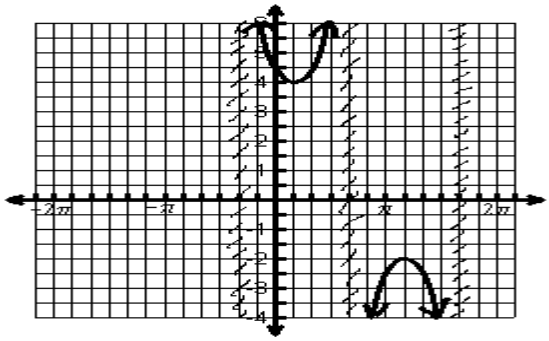


11) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____

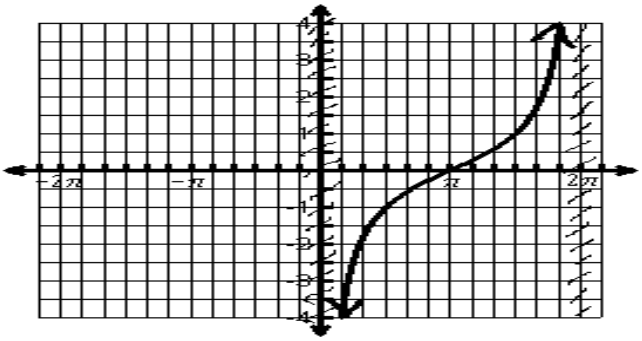


12) period _____ asym:_____

a = _____ b = _____

c = _____ d = _____

Equation: _____



NOTES – Inverse Trig Functions

Sketch the sine, cosine and tangent curves below.

sine | cosine | tangent

All three graphs are NOT one-to-one, so their <u>domains must be restricted</u> to find an inverse that IS a function.

Definition of Inverse Trig Functions:

Function	Domain	Range
y = arcsin x if and only if sin y = x	$[-1,\ 1]$	$\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$
y = arccos x if and only if cos y = x	$[-1,\ 1]$	$[0,\ \pi]$
y = arctan x if and only if tan y = x	$(-\infty,\ \infty)$	$\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

Reciprocals also have restrictions on their range:

$\csc^{-1}$ $\left[-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$

$\sec^{-1}$ $\left[0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right]$

$\cot^{-1}$ $(0, \pi)$

Sketch:

y = arcsin x or $y = \sin^{-1} x$ | y = arcos x or $y = \cos^{-1} x$ | y = arctan x or $y = \tan^{-1} x$

Having restricted the interval on which we graph so that each inverse is a function results in only one answer for each problem. The range of sine and tangent is in Quadrants I and IV, while the range of cosine is Quadrants I and II. Label this information on a coordinate plane below.

Evaluate the expression without using a calculator. Give your answer in radians.

1) $\tan^{-1} 1$

2) $\arccos \frac{\sqrt{2}}{2}$

3) $\sin^{-1}\left(-\frac{1}{2}\right)$

4) $\sec^{-1}\left(\sqrt{2}\right)$

5) $\arcsin 1$

6) $\csc^{-1} \frac{2}{\sqrt{3}}$

7) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

8) $\cot^{-1} \frac{\sqrt{3}}{3}$

9) $\arctan\left(-\frac{\sqrt{3}}{3}\right)$

10) $\arccos(-1)$

11) $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$

12) $\csc^{-1} 2$

Draw a reference triangle and evaluate each of the following expressions.

13) $\sin\left(\arccos \frac{1}{2}\right)$

14) $\tan\left(\arcsin \frac{3}{5}\right)$

15) $\cos\left(\arcsin \frac{1}{4}\right)$

16) $\tan\left(\arccos \frac{\sqrt{5}}{6}\right)$

17) $\sin\left(\csc^{-1} \frac{6}{5}\right)$

18) $\cot\left(\tan^{-1} \frac{1}{10}\right)$

19) $\sec\left(\cot^{-1} \frac{12}{5}\right)$

20) $\tan\left(\sec^{-1} \frac{\sqrt{13}}{3}\right)$

Homework – Inverse Trig Functions (from Textbook section 4.7 p. 349 – 350 #1 – 16 and #49 – 58)

In Exercises 1–16, evaluate the expression without using a calculator.

1. $\arcsin \frac{1}{2}$

2. $\arcsin 0$

3. $\arccos \frac{1}{2}$

4. $\arccos 0$

5. $\arctan \frac{\sqrt{3}}{3}$

6. $\arctan(-1)$

7. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

8. $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

9. $\arctan(-\sqrt{3})$

10. $\arctan \sqrt{3}$

11. $\arccos\left(-\frac{1}{2}\right)$

12. $\arcsin \frac{\sqrt{2}}{2}$

13. $\sin^{-1} \frac{\sqrt{3}}{2}$

14. $\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)$

15. $\tan^{-1} 0$

16. $\cos^{-1} 1$

In Exercises 49–58, find the exact value of the expression. (*Hint:* Sketch a right triangle.)

Show work on separate paper.

49. $\sin\left(\arctan \frac{3}{4}\right)$

50. $\sec\left(\arcsin \frac{4}{5}\right)$

51. $\cos(\tan^{-1} 2)$

52. $\sin\left(\cos^{-1} \frac{\sqrt{5}}{5}\right)$

53. $\cos\left(\arcsin \frac{5}{13}\right)$

54. $\csc\left[\arctan\left(-\frac{5}{12}\right)\right]$

55. $\sec\left[\arctan\left(-\frac{3}{5}\right)\right]$

56. $\tan\left[\arcsin\left(-\frac{3}{4}\right)\right]$

57. $\sin\left[\arccos\left(-\frac{2}{3}\right)\right]$

58. $\cot\left(\arctan \frac{5}{8}\right)$

NOTES – Solving simple trig equations using a calculator

Step 1 – Determine the reference angle using the trig inverse buttons on your calculator
Step 2 – Determine where the angle could lie (Quad I, II, III, IV)
Step 3 – Find both angle values of θ

I. Determine the values of θ, where $0° \le \theta < 360°$, to the nearest hundredth of a degree. (calc. in DEGREE mode)

1. sin θ = .7183 ref. angle: 2nd sin .7183 = 45.91°
Sine is positive in Quadrants I and II
Quadrant I answer is **45.91**
Quadrant II answer is 180º – 45.91 = **134.09**

2. tan θ = 1.6198

3. cos θ = – .6691

4. sec θ = – 4.8097 (type 2nd cos (1/ 4.8097))

5. cot θ = – .1228 (type 2nd tan (1/ .1228))

II. Determine the values of θ, where $0 \le \theta < 2\pi$, to the nearest hundredth of a radian. (calc. in RADIAN mode)

6. sin θ = – .8183

7. tan θ = 2.4567

8. csc θ = – 1.1859

HOMEWORK – Put work and answers on separate paper.

I. Determine the values of θ, where $0° \le \theta < 360°$, to the nearest hundredth of a degree.

1. sin θ = 0.4067

2. cos θ = – 0.5023

3. tan θ = 2.9988

4. sec θ = 1.1111

5. cot θ = – 1.2222

6. csc θ = 2.5012

II. Determine the values of θ, where $0 \le \theta < 2\pi$, to the nearest hundredth of a radian. (Radian Mode)

7. sin θ = 0.8143

8. cos θ = 0.7838

9. tan θ = –.2677

10. csc θ = 1.0204

11. cot θ = 0.5890

12. sec θ = – 1.5861