Algebra 2
Mock Regents Exam

Name ____

Teacher ____

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Write your answers to the Part I multiple-choice questions on the separate scantron sheet. Write your answers to the questions in Part II, III, and IV direction in this booklet. All work should be written in pen, except graphs and drawings, which should be done in pencil. Clearly indicate all necessary steps, including appropriate formula substitutions, diagrams, graphs, charts etc.

The formulas that you may need to answer some questions in this examination are found on the separate reference sheet. Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper.

The use of any communications device is strictly prohibited when taking this examination. If you use any communication devices, no matter how briefly, your examination will be invalidated and you will lose an extra credit opportunity.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL TOLD TO DO SO!

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, circle the numeral preceding the word or expression that best completes the statement or answers the question.

1) The expression $\frac{16\left(x^{\frac{1}{4}}y^{-\frac{1}{2}}\right)^6}{\sqrt{9xy^4}}$ is equivalent to

(1) $\frac{16x^3}{3y^5}$ (2) $\frac{16x}{3y^5}$ (3) $\frac{16xy}{3}$ (4) $\frac{16}{3xy^5}$

2) Solve for x: $\sqrt{x-1}+7=x$

(1) $\{10, 5\}$

(2) $\{5\sqrt{2}\}$

(3) $\{-7, 7\}$

(4) $\{10\}$

3) Which of the following is equivalent to $-4\sqrt{-48}$ in simplest radical form?

(1) $8\sqrt{12}$

(2) $16\sqrt{3}$

(3) $-8i\sqrt{12}$

(4) $-16i\sqrt{3}$

4) Find the values of x, y, and z in the following system of equations:

$$x + 2y - z = 3$$
$$2x + y + z = 0$$
$$x + 2y + z = 5$$

(1) x = 1, y = 0, z = 0

(2) x = 5, y = -4, z = -1

(3) x = -2, y = 3, z = 1

(4) x = -2, y = 4, z = -3

5) The expression $x^2(x+3) - 9(x+3)$ is equivalent to $(x+3)^n(x-3)$ when n equals

(1) 0

(2) 2

(3) 1

(4) 3

6) In order to successfully perform a trick, a flying trapeze artist must swing along a parabolic path that is equidistant from the floor and the pivot point where the trapeze rope is attached. The rope attached to the ceiling is 8 feet out and 16 feet above her starting point and the floor is 8 feet below her starting point. Use the focus of (8, 16) and directrix at $y = -8$ to determine the equation of the parabola.

(1) $y = \frac{1}{16}(x-8)^2 + 4$

(2) $x = \frac{1}{32}(y-16)^2$

(3) $x = (y-8)^2 + 4$

(4) $y = \frac{1}{48}(x-8)^2 + 4$

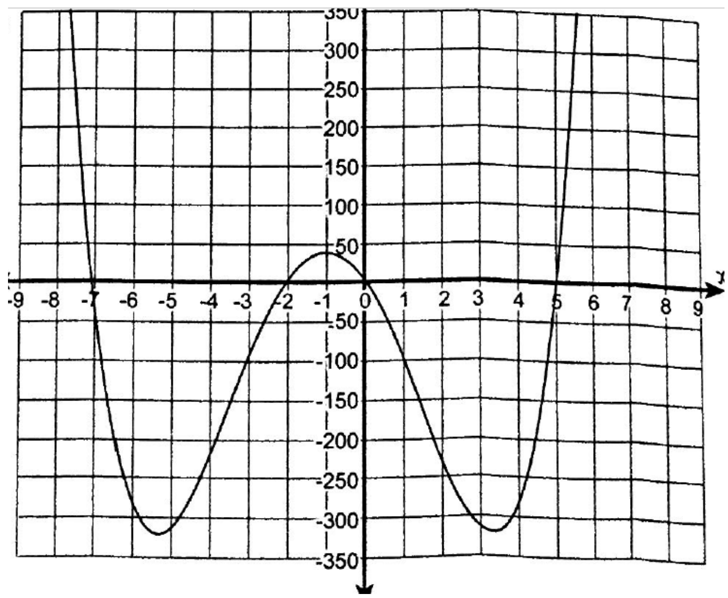
7) A quartic function, *p(x)*, is graphed to the right. Which of the following is the correct factorization of *p(x)*?

(1) (x – 7)(x – 2)(x + 5)

(2) (x + 7)(x + 2)(x – 5)

(3) x (x – 7)(x – 2) (x + 5)

(4) x(x + 7)(x + 2)(x – 5)



8) Cobalt has a half-life of 5.2714 years. Therefore, the amount of cobalt left after t years can be modeled by the function $N(t) = N_0\left(\frac{1}{2}\right)^{\frac{t}{5.2714}}$ where N_o is the initial amount of cobalt. The amount of cobalt in the sample is decreasing at approximately what rate each year?

(1) 9% (2) 12% (3) 10% (4) 13%

9) The expression $\frac{x^2+5x-20}{x-3}$ is equivalent to

(1) $x + 8 + \frac{4}{x-3}$

(2) $x + 8 - \frac{4}{x-3}$

(3) $x + 8$

(4) $x - 8 + \frac{4}{x-3}$

10) Solve $x^2 - 12 = -7x$

(1) $-3 \ and -4$

(2) $3 \ and \ 4$

(3) $\frac{-7\pm\sqrt{97}}{2}$

(4) $\frac{7\pm\sqrt{97}}{2}$

11) The factors of $x^4 - 13x^2 + 36$ when factored completely are

(1) $(x^2 + 9)(x^2 + 4)$

(2) $(x^2 + 9)(x + 2)(x - 2)$

(3) $(x + 3)(x - 3)(x + 2)(x - 2)$

(4) $(x + 3)(x + 3)(x + 2)(x + 2)$

12) The world's highest Ferris wheel, the High Roller, reaches a maximum height of 550 feet and a minimum height of 30 feet above the ground. It takes 30 minutes to complete one revolution on the High Roller. Which trigonometric function best models the height, in feet, above the ground of a passenger on the High Roller where t is the number of minutes since the passenger entered the car at the minimum point?

(1) $h(t) = -550\cos\left(\frac{\pi}{15}t\right)$

(2) $h(t) = -550\cos(30t)$

(3) $h(t) = -260\cos\left(\frac{\pi}{15}t\right) + 290$

(4) $h(t) = -260\cos(30t) + 290$

13) For the function $f(x) = -2x + 5$, find $f^{-1}(x)$.

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

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

(3) $f^{-1}(x) = 2x - 5$

(4) $f^{-1}(x) = \frac{1}{-2x+5}$

14) Jeremy uses the polynomial identity $(x^2 - y^2)^2 + (2xy)^2 = (x^2 + y^2)^2$ to generate the Pythagorean Triple, 9, 40, 41. What values of x and y did he use to generate the values for the three sides of a right triangle?

(1) x = 3, y = 4

(2) x = 9, y = 40

(3) x = 4, y = 5

(4) x = 16, y = 25

15) Determine the intersection points for $x^2 + y^2 = 1$ and $y = x + 1$.

(1) (0, -1) and (1, 0)

(2) (-1, 0) and (0, 1)

(3) (1, 0) and (0, 1)

(4) (-1, 0) and (1, 1)

16) The best sampling method for obtaining a random sample of students who represent the entire population of a high school would be
(1) Selecting every other person entering the weight room
(2) Selecting every fifth person entering the school building
(3) Selecting the first thirty people entering the cafeteria
(4) Asking for volunteers in physical education class

17)If $\sin\theta = \frac{7}{25}$ whereθ is an angle in standard position that terminates in quadrant II, what is the value of $\tan\theta$?

(1) $\frac{7}{24}$
(2) $-\frac{7}{24}$
(3) $\frac{24}{7}$
(4) $-\frac{24}{7}$

18)Solve for x: $x - \frac{15}{x+3} = \frac{5x}{x+3}$

(1) {-3}
(2) {5}
(3) {-3, 5}
(4) {3, -5}

19)Which of the following functions is even?

(1) $f(x) = |x| + 6$
(2) $g(x) = -\sin x$
(3) $h(x) = (x+3)^2$
(4) $j(x) = \ln(x)$

20)Jason is collecting data about his town. He is interested in where people live and their annual household income level. He collects the following data:

	Lives in District A	Lives in District B	Total
Income below $50,000	10,957	647	11,604
Income $50,000-$80,000	3,045	8,754	11,799
Income $80,000 and above	527	2,340	2,867
Total	14,529	11,741	26,270

Jason calculates the probability that a family lives in District A given that they have a household income level below $50,000. He also wants to use the information in the table to determine if these two events, living in District A and income below $50,000 are independent or dependent events. Which of the following gives the correct answer to both of his problems?

(1) 94%; the two events are independent
(2) 75%; the two events are independent
(3) 94%; the two events are dependent
(4) 75%; the two events are dependent

21) What is the 13th term of the sequence? $A = \{3, 6, 12\ldots\}$

(1) 4,096
(2) 8,192
(3) 12,288
(4) 24,576

22)Which of the following functions decreases as the input values approach both negative infinity and positive infinity?

(1) $f(x) = x^3 - 4x^2 + x$
(2) $h(x) = x^4 - 4x^3 + 2x + 8$
(3) $g(x) = -2x^3 - 4x^2 + 9$
(4) $r(x) = -x^4 + 9x^3 + x^2 + 8x + 2$

23)Which of the three functions has the largest and smallest average rate of change from $x = -2$ to $x = 4$?

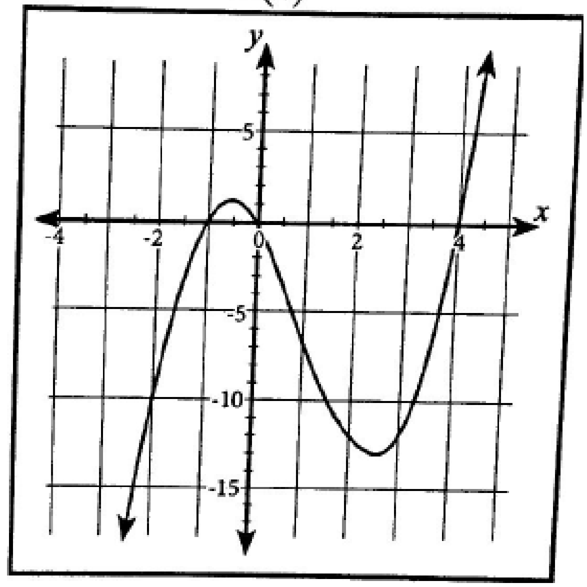
$g(x)$

x	$g(x)$
–4	–8
–2	0
0	8
2	0
4	–8
6	0
8	8

$h(x)$

$h(x) = |2x + 3| + 7$

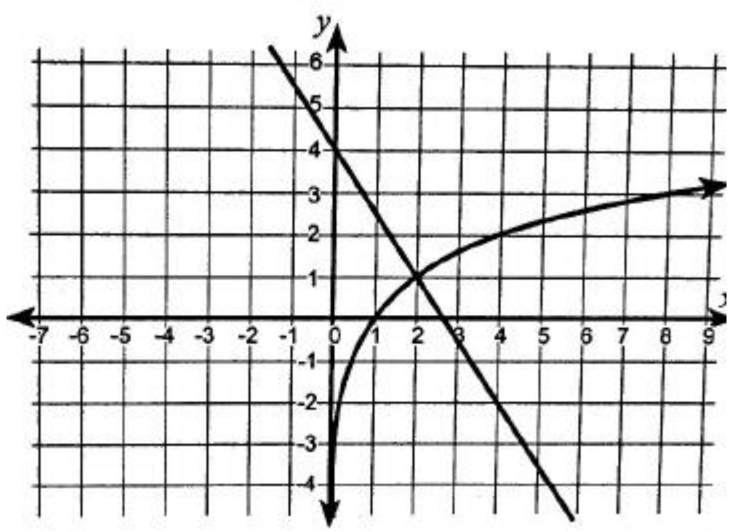
$m(x)$



(1) Largest: *h(x)* Smallest: *m(x)*
(2) Largest: *h(x)* Smallest: *g(x)*
(3) Largest: *g(x)* Smallest: *m(x)*
(4) Largest: *m(x)* Smallest: *h(x)*

24)Which of the following equations has a solution that is equal to the x-coordinate of the point of intersection of the accompanying graph?

(1) $log(x) = -\frac{3}{2}x + 4$
(2) $ln(x) = -\frac{3}{2}x+4$
(3) $log_2(x) = -\frac{3}{2}x + 4$
(4) $2^x = -\frac{3}{2}x + 4$



Part II

Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit.

25) Use an appropriate procedure to determine whether $x + 2$ is a factor of $p(x) = x^5 + 2x^4 - 3x^3 - 6x^2 - 6x - 12$. Justify your answer.

26) Rewrite the expression $(4x^2 - 6x)^2 - (4x^2 - 6x) - 2$ as a product of its factors.

27)Monthly mortgage payments can be calculated according to the fomula $A = \frac{Mp^{nt}(1-p)}{(1-p^{nt})}$ where

M is the size of the mortgage

n is the number of compounds per year

t is the length of the mortgage in years

r is the interest rate as a decimal

$$p = \left(1 + \frac{r}{n}\right)$$

What would the monthly mortgage payments be on a $180,000, 15 year mortgage with 6% interest, compounded monthly, to the *nearest dollar*?

28) Write $i(4 - 2i) - (3 + 2i)(4 - 6i)$ in simplest *a + bi* form.

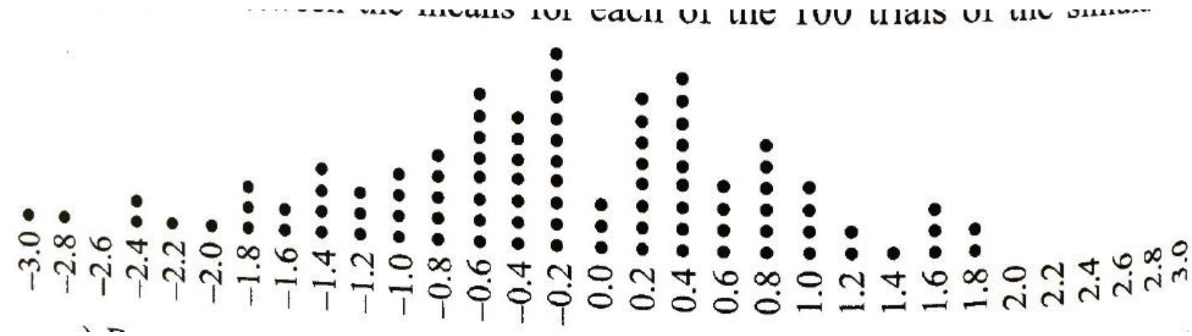
29) The recursive formula given below models the number of people, in millions, that own a smartphone in the U.S., *n* years after 2014.

$$a_2 = 18.5$$
$$a_n = a_{n-1} + 1.5$$

Write an equivalent explicit formula for the situation.

30) Lincoln conducts an experiment to determine if studying for an hour impacts the number of questions correct on the learner's permit (driving) test. He randomly assigns the students in his homeroom who have not yet taken the test to two groups. Group A agrees to study for an hour before taking the permit test. Group B agrees to take the test without studying.
Note: There are 20 total questions on the test.

To decide if the difference between the sample means is significant, Lincoln takes the 20 data values for the number of questions correct on the test, and randomly assigns them to two groups. He finds the mean of the two groups and their difference. Lincoln repeats this process 100 times. The dot plot below displays the difference between the means for each of the 100 trials of the simulation.



a) Based on the dot plot, is the difference in sample means between Group A and Group B significant? Why or why not?

b) Lincoln still believes that there is a significant difference between the group that studied and the group that did not. If he wants to redo the experiment, what could he do to increase his chances of finding a significant difference if there is one?

31) When an animal is selected at random from those at a zoo, the probability that it is North American(meaning that its natural habitat is in the North American continent) is 0.65, the probability that it is a carnivore is 0.52 and the probability that it is neither American nor a carnivore is 0.17. Using a Venn diagram, calculate the probability that a randomly selected animal is North American but not a carnivore.

32) Solve the following equation by completing the square and express your answer in simplest *a + bi* form: $4x^2 + 8x + 7 = 0$

Part III

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit.

33) The chart below shows the average daily temperature each month for Saugerties, NY.

Month	Average Daily High Temperature
January	34
February	38
March	48
April	62
May	73
June	81
July	85
August	82
September	74
October	63
November	51
December	39

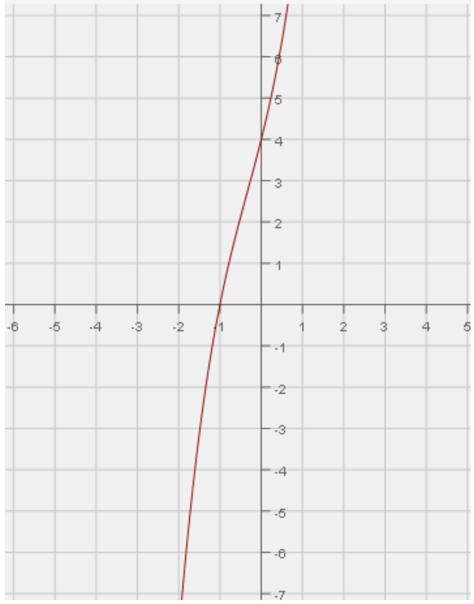
Find a sinusoidal equation that models the average daily temperature as a function of the month of the year for Saugerties, NY.

34) Two versions of a standardized test are given, an April version and a May version. The statistics for the April version show a mean score of 500 and a standard deviation of 20. The statistics for the May version show a mean score of 530 and a standard deviation of 16. Assume the scores are normally distributed.

a) Joanna took the April version and scored in the interval 530-560. What is the probability, to the nearest ten-thousandth, that a test paper selected at random from the April version scored in the same interval?

b) Maria took the May version. In what interval must Maria score to claim she scored as well as Joanne?

35)The graph of the polynomial function $f(x) = x^3 + x^2 + 4x + 4$ is shown below.



a) Based on the appearance of the graph, what does the real solution to the equation $x^3 + x^2 + 4x + 4 = 0$ appear to be? Sam does not trust the accuracy of the graph. Prove to him algebraically that your answer is in fact a zero of $y = f(x)$.

b) Find all the zeros of the function.

c) Write as the product of three linear factors.

36) The temperature, T, of a given cup of hot chocolate after it has been cooling for t minutes can best be modeled by the function below, where T_o is the temperature of the room and k is a constant.

$$\ln(T - T_0) = -kt + 4.718$$

A cup of hot chocolate is placed in a room that has a temperature of 68°. After 3 minutes, the temperature of the hot chocolate is 150°. Compute the value of k to the *nearest thousandth*. [Only an algebraic solution can receive full credit.]

Using this value of k, find the temperature, T, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*. [Only an algebraic solution can receive full credit.]

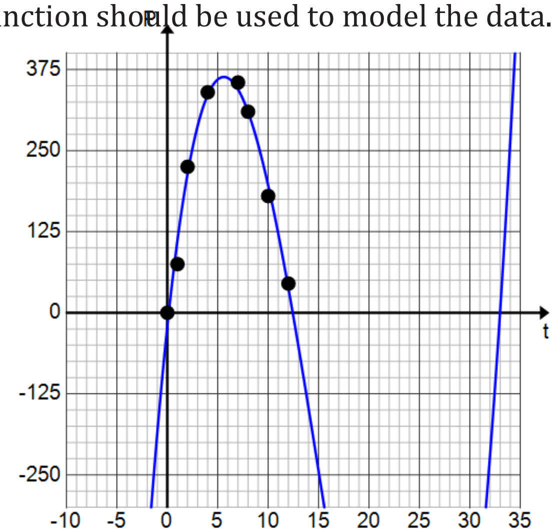
Part IV

Answer all questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit.

37) The owners of Dizzy Lizzy's, an amusement park, are studying the wait time at their most popular roller coaster. The table below shows the number of people standing in line for the roller coaster t hours after Dizzy Lizzy's opens.

***t* (hours)**	0	1	2	4	7	8	10	12
***P* (people in line)**	0	75	225	345	355	310	180	45

Jaylon made a scatterplot and decided that a cubic function should be used to model the data. His scatterplot and curve are shown below.



a) Estimate the time at which the line is the longest. Explain how you know.

b) Estimate the number of people in line at that time. Explain how you know.

c) Estimate the t-intercepts of the function used to model this data.

d) Use the intercepts to write a function that represents this data in factored form, with c as your constant.

e) Use the relative maximum to find c.