Summer Assignment
Pre-Calculus

Directions: Show all work for the following problems, even the multiple choice. You should only use a calculator when told to do so.

Academic Integrity: All work should be completed independently and without the assistance of unapproved resources. Any work violating academic integrity will be subject to a "0" and any additional consequences as outlined in the Knox Academic Integrity Policy attached to this assignment.

Due Date: Your work is due the first day of your Pre-Calculus class. All late work will be subjected to a grade reduction or penalty as outlined in the course syllabus and copied below:

All major assignments not submitted on the due date will face a 10% deduction of max points per day for up to five (5) days and up to a 50% deduction.
*Summer Assignments for AP Classes that are not submitted on time will result in the student being dropped from the course.*

If you have any questions or concerns regarding this assignment, please contact the Dean of Academics, Mrs. Pergola, at dpergola@knoxschool.org .

Multiple Choice

1. The solutions to $(x+4)^2 - 2 = 7$ are
   1) $-4 \pm \sqrt{5}$
   2) $4 \pm \sqrt{5}$
   3) -1 and -7
   4) 1 and 7

2. What is the solution set of the equation
   $3x^2 - 34x - 24 = 0$?
   1) $\{-2, 6\}$
   2) $\{-12, \frac{2}{3}\}$
   3) $\{-\frac{2}{3}, 12\}$
   4) $\{-6, 2\}$

3. The solution to the equation $x^2 - 6x = 0$ is
   1) 0, only
   2) 6, only
   3) 0 and 6
   4) $\pm\sqrt{6}$

4. Consider the function $p(x) = 3x^3 + x^2 - 5x$ and the graph of $y = m(x)$ below.
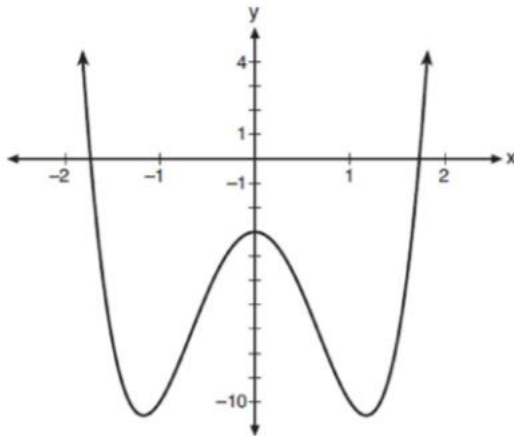

Which statement is true?
1) $p(x)$ has three real roots and $m(x)$ has two real roots.
2) $p(x)$ has one real root and $m(x)$ has two real roots.
3) $p(x)$ has two real roots and $m(x)$ has three real roots.
4) $p(x)$ has three real roots and $m(x)$ has four real roots.

5. Use logarithms to solve and a calculator to round answer.

The solution of $87e^{0.3x} = 5918$, to the *nearest thousandth*, is
1) 0.583
2) 1.945
3) 4.220
4) 14.066

6. Given $f(x) = \frac{1}{2}x + 8$, which equation represents the inverse, $g(x)$?
1) $g(x) = 2x - 8$
2) $g(x) = 2x - 16$
3) $g(x) = -\frac{1}{2}x + 8$
4) $g(x) = -\frac{1}{2}x - 16$

7. Given $c(m) = m^3 - 2m^2 + 4m - 8$, the solution of $c(m) = 0$ is   (Hint: Solve by factoring)
1) ± 2
2) 2, only
3) $2i, 2$
4) $\pm 2i, 2$

8. The expression $\dfrac{x^3 + 2x^2 + x + 6}{x + 2}$ is equivalent to
1) $x^2 + 3$
2) $x^2 + 1 + \dfrac{4}{x + 2}$
3) $2x^2 + x + 6$
4) $2x^2 + 1 + \dfrac{4}{x + 2}$

9. The value of the *x*-intercept for the graph of $4x - 5y = 40$ is
1) 10
2) $\dfrac{4}{5}$
3) $-\dfrac{4}{5}$
4) -8

10. The graph of the equation $y = ax^2$ is shown below.
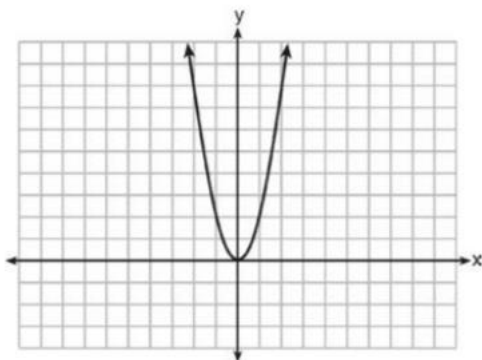
If a is multiplied by $-\frac{1}{2}$, the graph of the new equation is
1) wider and opens downward
2) wider and opens upward
3) narrower and opens downward
4) narrower and opens upward

11. What is the value of x in the equation $\frac{x-2}{3} + \frac{1}{6} = \frac{5}{6}$?
1) 4
2) 6
3) 8
4) 11

12. Which situation could be modeled by using a linear function?
1) a bank account balance that grows at a rate of 5% per year, compounded annually
2) a population of bacteria that doubles every 4.5 hours
3) the cost of cell phone service that charges a base amount plus 20 cents per minute
4) the concentration of medicine in a person's body that decays by a factor of one-third every hour

13. Krystal was given $3000 when she turned 2 years old. Her parents invested it at a 2% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Krystal had in the account when she turned 18?

(1) $3000(1 + 0.02)^{16}$ (3) $3000(1 + 0.02)^{18}$

(2) $3000(1 - 0.02)^{16}$ (4) $3000(1 - 0.02)^{18}$

14. A polynomial function contains the factors x, $x - 2$, and $x + 5$. Which graph(s) below could represent the graph of this function?

I   II   III
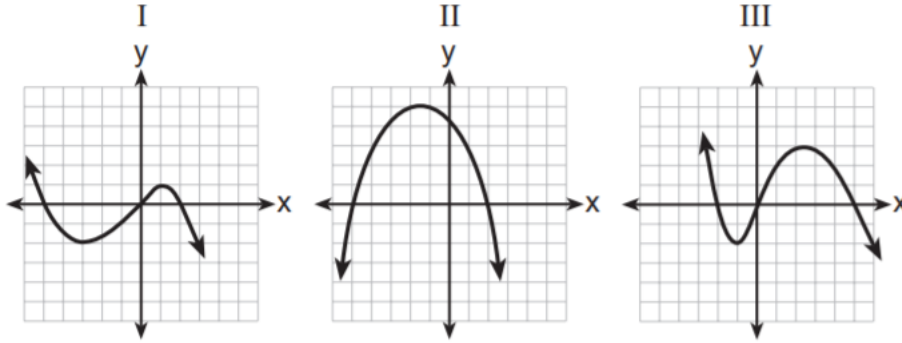
(1) I, only   (3) I and III

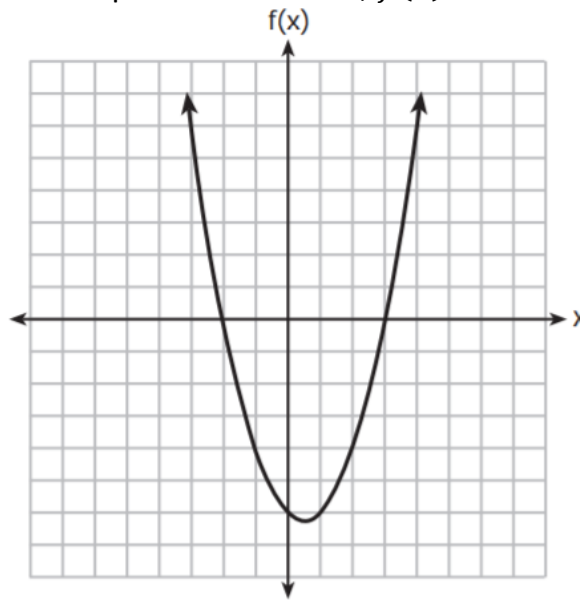(2) II, only   (4) I, II, and III

15.   (Hint: Graph it!)

The range of the function $f(x) = |x + 3| - 5$ is

(1) $[-5, \infty)$ (3) $[3, \infty)$

(2) $(-5, \infty)$ (4) $(3, \infty)$

Free Response Questions. Again, show all work.

16. Below is the graph of the quadratic function, $f(x)$.

f(x)

Could the factors of $f(x)$ be $(x + 2)$ and $(x - 3)$? Based on the graph, explain why or why *not*.

17. Multiply the following rational expression. State any restriction on the variable.

$$\frac{x^2-16}{x^2} \cdot \frac{x^2-4x}{x^2-x-12}$$

18. Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

19. Use logarithms to solve the equation below. Leave answer as an exact value.

$$1.7^x = 20$$

20. Solve the logarithmic equation below.

$$\log (x - 9) + \log x = 1$$

21. Solve the logarithmic equation below.

$$\log_2 2x = \log_2 100$$

22. Condense the expression into one logarithm.

$$logx + 2logy - \frac{1}{3}logz$$

23. Expand the following logarithm.

$$ln\frac{3x^4}{yz^5}$$

24. Using the parent function $y = |x|$, state all the transformations that took place to get the function $f(x) = -6|x + 2| + 1$.

25. Divide the following rational expression. State any restrictions on the variable.

$$\frac{15}{y^2+2y-8} \div \frac{5y}{y-2}$$

26. In a classroom of 26 students, 12 are boys and 14 are girls. A committee of 5 students is to be chosen at random. How many ways can the group of 5 consist of 3 girls and 2 boys?

27. Fill in the missing information and provide a rough sketch of the polynomial.

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

Zeros and their multiplicities: Graph:

Y-intercept:

End behavior:

   as $x \to -\infty$, $f(x) \to$ _____

   as $x \to \infty$, $f(x) \to$ _____

28. Solve the absolute value equation below. Check your answers.

$$|2x - 3| + 5 = 12$$

29. Find the equations of the vertical asymptote and horizontal asymptote for the following function.

$$y = -\frac{3}{x + 5} + 2$$

30. Multiply and simplify. Write answer in standard form.

$$(2x - 3)(x + 6) - 2(x + 3)$$

31. Write the equation of a line in point-slope form that passes through the point $(-4, 5)$ that is parallel to the line $2y = 3x + 6$.

32. Write the equation of a line in slope intercept form that passes through the point $(8, -3)$ that is perpendicular to the line $y = 4x + 5$.

33. Graph the following linear equality. Shade appropriately.

$$y \leq -\frac{1}{2}x + 3.$$
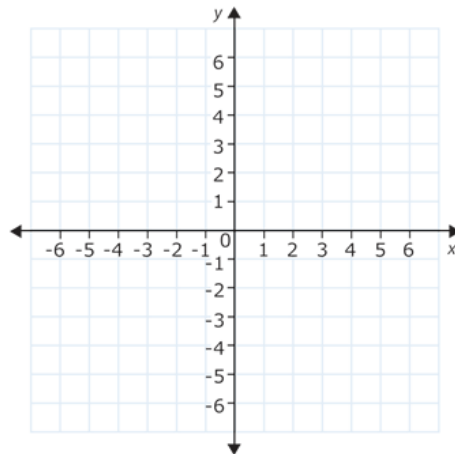
34. Write a system of equations for the following word problem. Then, solve the system.

A hotel has 260 rooms. Some are singles, and some are doubles. The singles cost $35 and the doubles cost $60. Because of a math teachers' convention, all of the hotel rooms are occupied. The sales for this night are $14,000. How many of each type of room does the hotel have?

35. Solve the following equation by completing the square. Leave answer in simplest radical form.

$$2x^2 - 8x = -12$$

36. Simplify: $(3 - 5i)(4 + 2i)$ where i represents the imaginary unit.

37. Graph the following parabola. Find the vertex, axis of symmetry, domain, and
    range. $y = -2x^2 + 4x - 1$

38.

	Cars	Trucks	Total
Black	12	9	21
Red	10	13	23
Total	22	22	44

The table above shows the type of vehicle and color of vehicle owned by 44 people.

Find the probability that if a person is chosen at random, the person owns:

a. A truck that is red

b. Either a red car or a black truck

c. Either a red vehicle or a truck

d. A car, given the vehicle is red