



# THE KNOX SCHOOL

## Pre-Calculus 2020 Summer Assignment

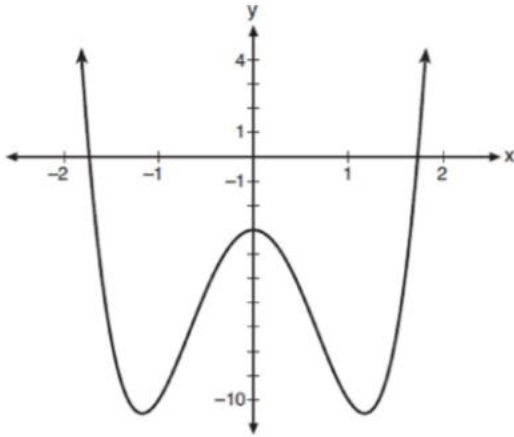
**Directions:** You must show all work, even for multiple choice. Any graphing problem should be done without a graphing calculator.

**Due Date:** First day of school! You will be held accountable for this material upon your return to school. Yes, that means a test or a quiz on this material is going to happen.

### Multiple Choice

- The solutions to  $(x + 4)^2 - 2 = 7$  are
  - $-4 \pm \sqrt{5}$
  - $4 \pm \sqrt{5}$
  - $-1$  and  $-7$
  - $1$  and  $7$
- What is the solution set of the equation  $3x^2 - 34x - 24 = 0$ ?
  - $\{-2, 6\}$
  - $\{-12, \frac{2}{3}\}$
  - $\{-\frac{2}{3}, 12\}$
  - $\{-6, 2\}$
- The solution to the equation  $x^2 - 6x = 0$  is
  - $0$ , only
  - $6$ , only
  - $0$  and  $6$
  - $\pm\sqrt{6}$

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. 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)  $g(x) = -\frac{1}{2}x - 16$

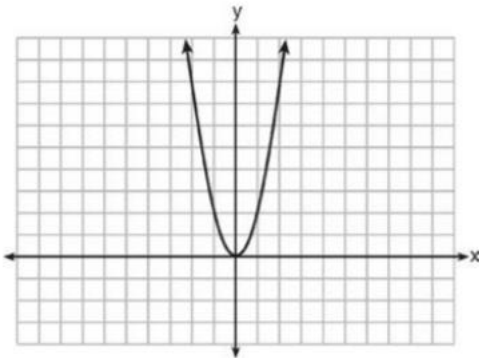
7. Given  $c(m) = m^3 - 2m^2 + 4m - 8$ , the solution of  $c(m) = 0$  is
- 1)  $\pm 2$
  - 2) 2, only
  - 3)  $2i, 2$
  - 4)  $\pm 2i, 2$

(Hint: Solve by factoring)

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

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

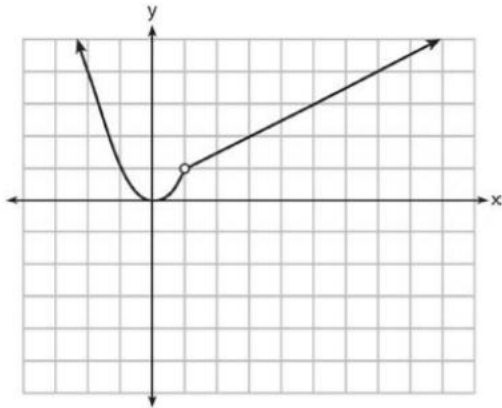
- 1) wider and opens downward
- 2) wider and opens upward
- 3) narrower and opens downward
- 4) narrower and opens upward

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. A function is graphed on the set of axes below.



Which function is related to the graph?

- 1)  $f(x) = \begin{cases} x^2, & x < 1 \\ x - 2, & x > 1 \end{cases}$
- 2)  $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{1}{2}x + \frac{1}{2}, & x > 1 \end{cases}$
- 3)  $f(x) = \begin{cases} x^2, & x < 1 \\ 2x - 7, & x > 1 \end{cases}$
- 4)  $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{3}{2}x - \frac{9}{2}, & x > 1 \end{cases}$

13. Which situation could be modeled by using a linear function?

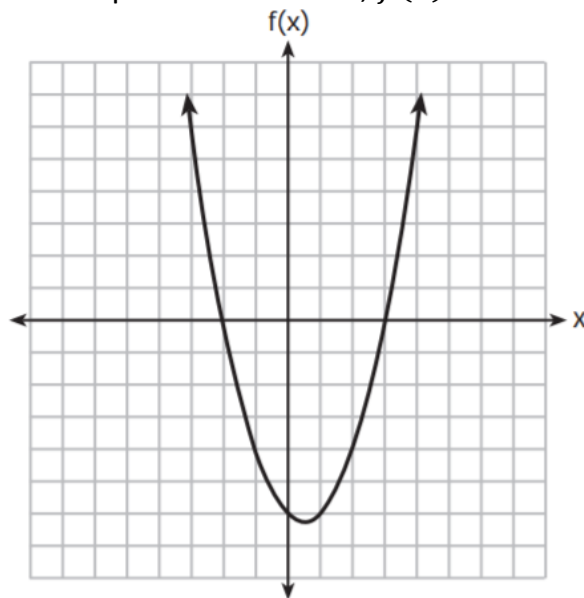
- 1) a bank account balance that grows at a rate of 5% per year, compounded annually
- 2) a population of bacteria that doubles every 4.5 hours
- 3) the cost of cell phone service that charges a base amount plus 20 cents per minute
- 4) the concentration of medicine in a person's body that decays by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



Free Response Questions. Again, show all work.

17. Algebraically determine whether the function  $j(x) = x^4 - 3x^2 - 4$  is odd, even, or neither.

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



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

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

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

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

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

$$1.7^x = 20$$

22. Solve the logarithmic equation below.

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

23. Solve the logarithmic equation below.

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

24. Condense the expression into one logarithm.

$$\log x + 2\log y - \frac{1}{3}\log z$$

25. Expand the following logarithm.

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

26. Using the parent function  $y = |x|$ , state all the transformations that took place to get the function  $f(x) = -3|x + 2| + 1$ .

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

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

28. Graph the following circle. State the center and radius.

$$(x - 3)^2 + (y + 2)^2 = 25$$

29. 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:

Y-intercept:

End behavior:

as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow$  \_\_\_\_\_

as  $x \rightarrow \infty$ ,  $f(x) \rightarrow$  \_\_\_\_\_

Graph:

30. Graph the following ellipse. Label all four vertices.

$$\frac{(x + 4)^2}{9} + \frac{(y - 1)^2}{16} = 1$$

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

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

32. Solve the absolute value inequality below. Graph the solution on a number line and write answer in interval notation.

$$|x + 4| \geq 10$$

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

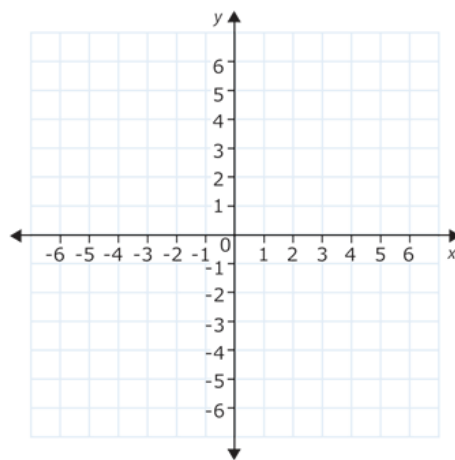
$$(2x - 3)(x + 6) - 2(x + 3)$$

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

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

36. Graph the following linear equality. Shade appropriately.

$$y \leq -\frac{1}{2}x + 3.$$



37. 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?

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

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

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

40. Graph the following parabola. Find the vertex, axis of symmetry, domain, and range.

$$y = -2x^2 + 4x - 1$$