Pre-Calculus Midterm Practice Test (Units 1 through 3)

Learning Target 1A—I can describe a set of numbers in a variety of ways.
   1. Write the following inequalities in interval notation.
    a. $x \leq 2$ b. $x > 6$

    c. $x < -8$ or $x \geq 9$ d. $x \geq 2$ and $x < 5$

Learning Target 1B—I can identify functions from data tables, graphs, and descriptions of a set of relations.
   2. Describe the domain and range for the following functions using interval notation.
    a. $y = x^2 + 2x$

    b. $f(x) = \sqrt{x-3}$

    c. $y = \dfrac{1}{x}$

   3. What are the three types of discontinuity.

Learning Target 1C—I can identify increasing and decreasing functions and intervals.
   4. Describe the increasing and decreasing intervals in interval notation for the following functions.
    a. $f(x) = \sqrt{x-4}$

    b. $y = x^2 + 4x$

5. Graph the function $y = x^4 - 3x^3 + 2x$ on your calculator. Find the x-value of all extema to the nearest hundredth and describe what type of extrema it is.

Learning Target 1D—I can determine the average rate of change for a function.

6. Find the average rate of change for $f(x) = x^2 + 2x$ on the interval $[-1, 1]$.

7. Find the average rate of change for $f(x) = -3x^2$ on the interval $[1, 4]$.

Learning Target 1E—I can compute the difference quotient for a given function.

8. Find the difference quotient for $f(x) = 2x^2$. Simplify your answer.

9. Find the difference quotient for $f(x) = x^2 + 4x$. Simplify your answer.

10. Find the difference quotient for $f(x) = 2x^2 + x$. Simplify your answer.

Learning Target 2A—I can use multiple transformations to determine the graph from an equation or vice versa for linear and quadratic functions.

    11. Describe how you transform $y = x^2$ to $f(x) = (x + 3)^2 - 1$.

    12. Describe how $f(x) = (x + 1)^2 - 2$ is a transformation of $f(x) = x^2$.

Learning Target 2B—I can solve quadratic equations by factoring, quadratic formula, and completing the square.

    13. Complete the square to write the following quadratics in vertex form.

        a. $f(x) = x^2 + 4x$

        b. $f(x) = -x^2 + 2x - 1$

    14. Solve the following quadratics using the method of your choice.

        a. $0 = x^2 + x$

        b. $0 = x^2 + 7x + 6$

        c. $0 = 2x^2 + 3x - 6$

Learning Target 2C—I can identify key features of a parabola from its vertex form equation, and by converting a quadratic function from standard form to vertex form.

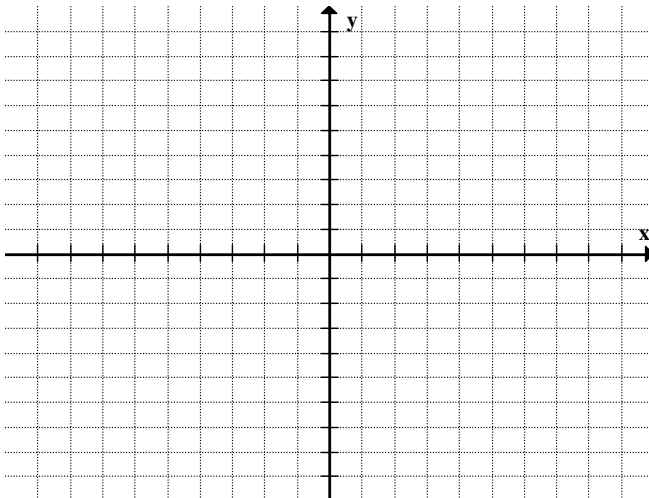**15.** Find the value of x that makes $x^2 + x$ equal 4.

16. Find the value of x that makes $x^2 + 4x$ equal 5.

Learning Target 2D—I can define, interpret, use piecewise functions in function notation and as a graph.

17. Graph the piecewise function $f(x) = \begin{cases} x^2 + x, & \text{if } x < 0 \\ x, & \text{if } x \geq 0 \end{cases}$.
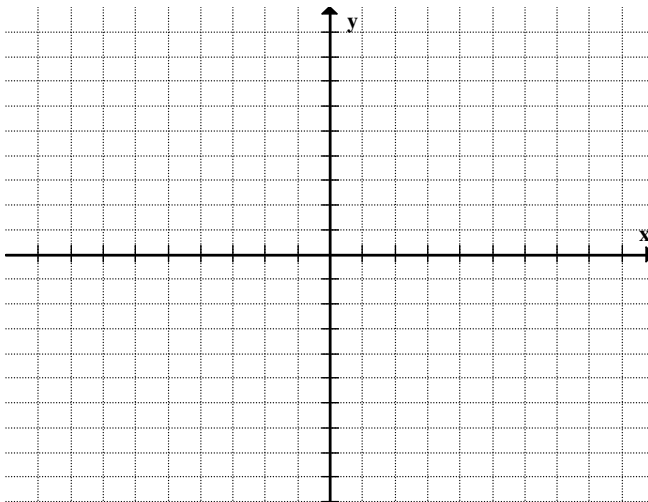
18. Graph the piecewise function $f(x) = \begin{cases} x^2 + 4x, & \text{if } x < -2 \\ x, & \text{if } x \geq -2 \end{cases}$.

Learning Target 2E—I can identify linear and quadratic correlations in data and use technology to define an appropriate linear or quadratic regression function.

19. Consider the table below to answer the following questions.

x	1	2	3	4	5	6	7	8	9
$f(x)$	5.8	6.2	7.3	7.8	8.4	8.1	9.1	10.3	11.2

   a. Find the linear regression model and state the r value.

   b. Find the quadratic regression model and state the R^2.

   c. Which model fits the data the best? Explain your reasoning.

   d. Use the model that best fits the data to find $f(18)$.

Learning Target 3A—I can represent and apply power functions, with integer and rational powers, as equations and graphs.

20. Sketch a graph of the power functions of the form $y = kx^a$ described below.

   a. k is positive and a is a positive odd integer.

   b. k is negative and a is a positive even integer.

   c. k is positive and $a = \frac{1}{3}$.

Learning Target 3B—I can identify the extrema, symmetry, and zeros of polynomial functions and use them to graph and model with these functions.

21. Find the exact values of the zeros of the function $y = x^4 + x^3 - x^2 + x - 2$ using your calculator to start if needed.

22. Find the exact values of the zeros of the function $y = x^3 + 5x^2 + 3x - 9$ using your calculator to start if needed.

Learning Target 3C— I can describe and apply the Fundamental Theorem of Algebra to find real and complex solutions of polynomial equations.

23. Find all solutions of $0 = x^4 + 2x^3 - 11x^2 + 8x - 60$.

24. Find all solutions of $0 = x^3 - 3x^2 + 5x - 15$.