Build a Study Guide: Mid-Term Review Name: ______________________________

In groups, students will solve a problem set (show / explain all work) and make notes about key pieces of information that would be important in order to solve exercises of that type and of those related to the example.

1. Graph a line with the following features: • Slope = -3 • Y-intercept = 5
Solution.
Notes. • Be sure you can find the slope of a line given two points on the line. • Be sure you can determine the slopes of parallel and perpendicular lines.

2. Evaluate the function.

$$f(x) = -x^2 - 9x$$

Find $f(-2)$.

Solution.

Notes.

- Be able to determine if a set of coordinate points represents a function.
- Be able to determine if a graph represents a function.

3. Find the domain of $f(x)$.

$$f(x) = \frac{3x - 4}{x^2 - 3x - 4}$$

Solution.

Notes.

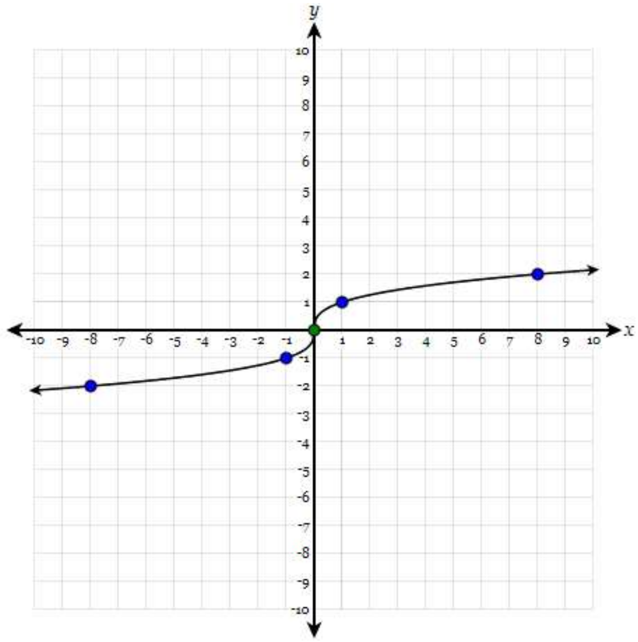
- Be able to determine the domain of a function given its graph.
- Be able to evaluate (like #2) piece-wise functions.
- Be able to determine intervals over which a function is increasing or decreasing.

4. Graph the equation below by transforming the given graph of the parent function.

$$y = -\sqrt[3]{x-1} - 3$$

Solution.

Parent Function: $y = \sqrt[3]{x}$



Notes.

- Be able to transform different function types and identify a transformation given a graph of a function and its parent function.

5. Express your answer as a polynomial in standard form.

$$f(x) = 4x + 5$$
$$g(x) = x^2 + 4x + 2$$

Find $f(g(x))$

Solution.

Notes.

- Be able to evaluate a value for a composition. For instance, be able to find $g(f(x))$, and then evaluate $g(f(-2))$.
- Be able to perform combinations of functions. Remember, this means we are doing arithmetic with 2 different functions: addition, subtraction, multiplication, and division.

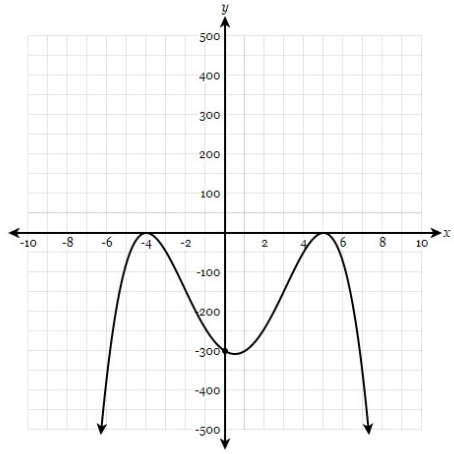
6. Given $f(x) = 3x^3 + kx - 10$, and $x - 2$ is a factor of $f(x)$, then what is the value of k?

Solution.

Notes.

- Be able to perform polynomial division (definitely synthetic).
- Understand the Factor Theorem and be able to use it to determine if given binomials are a factor of a function.

7. Write a function in any form that would match the graph shown below.



Be sure to determine this function's unique lead coefficient (use the given y-intercept).

Solution.

Notes.

- Be able to write the equation of a quadratic function given a table a values (including solving for its unique lead coefficient.
- Be able to determine the equation of a quadratic function given its roots (including imaginary roots).
- Be able to solve for the roots of a quadratic function using the quadratic formula.

8. If $f(x) = x^3 - 2x^2 - 29x + 30$ and $f(1) = 0$, then find all the zeros of $f(x)$ algebraically.
Solution.
Notes.

9. Simplify the expression completely if possible.

$$\frac{2x^2}{x^3 + x^2}$$

Solution.

Notes.

- Be able to list the restrictions of a rational function/expression (identify the values that make the expression undefined).

10. Determine each feature of the graph of the given function.

$$f(x) = \frac{5x + 10}{x^2 + 2x}$$

Solution.

- Horizontal Asymptote:
- Vertical Asymptote:
- X-intercept:
- Y-intercept:
- Hole (x, y):

Notes.

- Be able to plot the features listed above to create the graph of a rational function.

11. $7800 is placed in an account with an annual interest rate of 6.5%. How much will be in the account after 29 years, to the nearest cent?

Solution.

- This is a simple interest problem. *Not* compound interest. Use $f(x) = a(1 \mp r)^x$

Notes.

- Be able to graph exponential functions (identifying asymptotes and plotting 2 points – remember these problems on Delta Math).

12. Jocelyn invested $390 in an account paying an interest rate of 2.7% compounded daily. Assuming no deposits or withdrawals are made, how much money, to the nearest cent, would be in the account after 18 years?

Solution.

Notes.

- Be able to use the compound interest formula to solve for future values.
- Be able to use the continuously compounding interest formula to solve for future values.