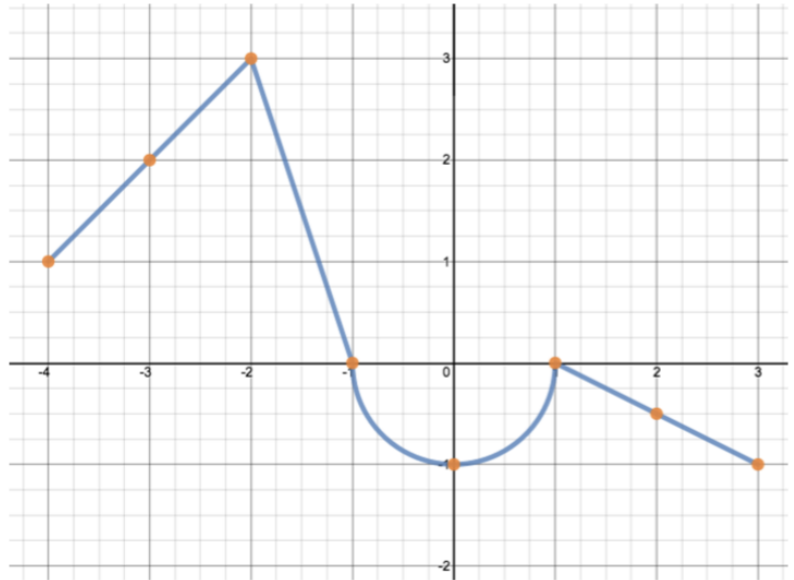# PreCalc-Unit 1 Test Review: Properties of Functions

1. Given the graph at right, determine each of the following intervals. Use interval notation to express your intervals.
   a. Increasing and Decreasing
   b. Positive and Negative
   c. Concave Up
   d. Domain and Range
2. Is the graph a function? Explain your reasoning.
3. Find $f(-2)$ and $f(x) = 2$.
4. Find $g(-2)$, $g(-3)$ and $g(3)$.

$$g(x) = \begin{cases} 3x+12, & x \le -3 \\ |x|, & -3 < x < 3 \\ -3x+12, & x \ge 3 \end{cases}$$

5. Would the graph of $g(x)$ in the last problem be continuous? Explain how you know.

6. Given $g(x) = x^5 - 4$, is $g(x)$ even, odd, or neither? Explain your reasoning.
   THEN…draw graphs AND write equations for examples of a different even function, odd function, and function that is neither even nor odd.

7. Let $f(x) = 6x^2$ and $g(x) = \sqrt{3x - 1}$ and $h(x) = (x - 4)^2$ and $j(x) = \frac{x}{x^2 - 9}$
   a. Find the domain of each function. Be sure to consider any restrictions or limitations. Write your answers in interval notation.
   b. Find: $2g(t + 4)$
   c. Find: $h(3n - 5)$
   d. Find: $(g - f)(7)$
   e. Find: $(f - h)(x)$
   f. Find: $(f \cdot g)(x)$
   g. Find: $(f \div g)(2)$
   h. Find: $(f \circ g)(x)$
   i. Find: $(g \circ h)(1)$
   j. Find: $g^{-1}(x)$
   k. Verify algebraically that your answer is actually the inverse.

8. Write an equation for a function given each set of information below:
   a. The parent function of $f(x) = x^4$ gets shifted right 5 units and down 1 unit
   b. The parent function of $f(x) = \sqrt{x}$ gets a vertical compression by a factor of 3 and moves left 2 units
   c. The parent function is $f(x) = x^3$ and the new function is seen in this graph:
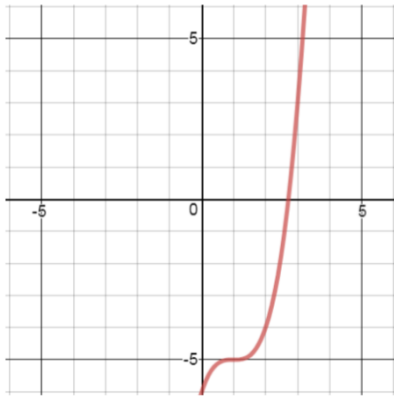
   d. The parent function is $f(x) = \sqrt{x}$ and the new function is seen in this graph:
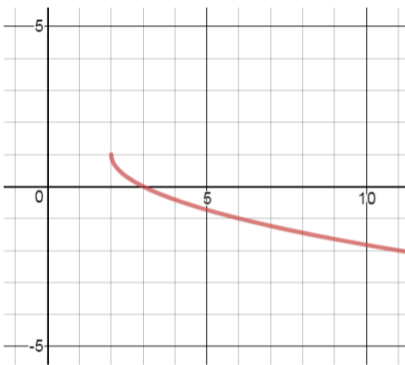

9. If $g(x) = 3\sqrt{-x} + 2$, what transformations occurred to the parent function of $f(x) = \sqrt{x}$? Explain your reasoning.

10. If $g(x) = -|x - 2| - 7$, what transformations occurred to the parent function of $f(x) = |x|$? Explain your reasoning.

11. Factor:
   a. $p(x) = x^4 - 1$
   b. $p(x) = x^5 - 5x^3 + 4x$
   c. $p(x) = x^8 - 1$
   d. $2p^3 + 5p^2 + 6p + 15$
   e. $mz - 5mh^2 - 5nz + 25nh^2$
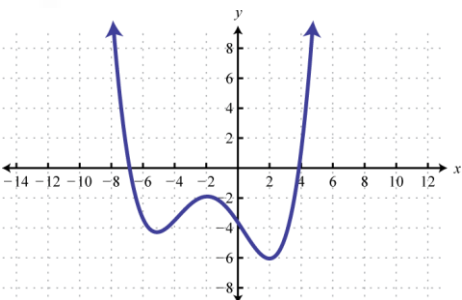   f. $40u^3 - 625v^3$
   g. $27p^3 + q^3$

12. Graph the following function without the use of graphing technology:

$$f(x) = \frac{4x^2 - 36}{x^2 - 2x - 8}$$

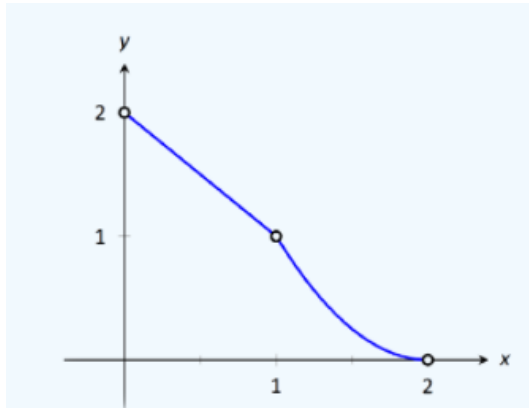13. Describe the end behavior of the graph using limits.
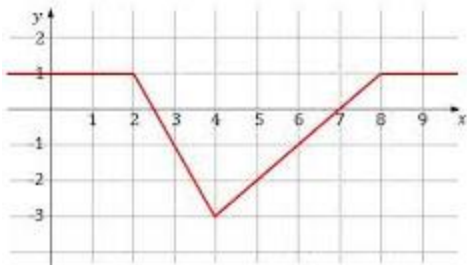
a.

b.

14. Use the graph to answer the following questions:

1. $\lim\limits_{x \to 1^-} f(x)$

2. $\lim\limits_{x \to 1^+} f(x)$

3. $\lim\limits_{x \to 1} f(x)$

4. $f(1)$

5. $\lim\limits_{x \to 0^+} f(x)$

6. $f(0)$

7. $\lim\limits_{x \to 2^-} f(x)$

8. $f(2)$