

Homework 4.4: Rates of Change

Name: _____

Math 3

Directions: Order the following numbers from least to greatest.

1. 100^3 $\sqrt{100}$ $\log_2 100$ 100

1. $\log_2 100, \sqrt{100}, 100, 100^3$

2. 2^{-1} $\sqrt{100}$ $\log_2(1/8)$ 0

2. $\log_2(1/8), 0, 2^{-1}, \sqrt{100}$

3. 2^0 $\sqrt{16}$ $\log_2 8$ 2

3. $2^0, 2, \log_2 8, \sqrt{16}$

Directions: Which is greater? For each problem, make a true statement by placing the appropriate inequality symbol between the two expressions. (Hint: Think about what you know about the expression and the end behavior as well as rates of change of the function instead of plugging in values).

If $x < -100$, then:	If $x > 100$, then:
4. x^2 <u>></u> 2^x	5. x^2 <u><</u> 2^x
6. x^5 <u><</u> x^2	7. x^5 <u>></u> x^2
8. x^2 <u>></u> x^3	9. x^2 <u><</u> x^3

Directions: Determine the function type and state the end behavior.

10. $f(x) = x^2 + 12x - 1$
quadratic

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

11. $g(x) = 4 \cdot 2^x$
exponential

$x \rightarrow -\infty, f(x) \rightarrow 0$
 $x \rightarrow \infty, f(x) \rightarrow \infty$



12. $h(x) = -x^3 + 1$
cubic

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

13. $p(x) = -x^2 + 3x - 1$
quadratic

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

Directions: Use questions # 10-13 to answer the following.

14. Which function above has the greatest value at $x = 1000$?

14. $g(x)$

15. Which function above is always increasing?

15. $g(x)$

16. Which function above is always decreasing?

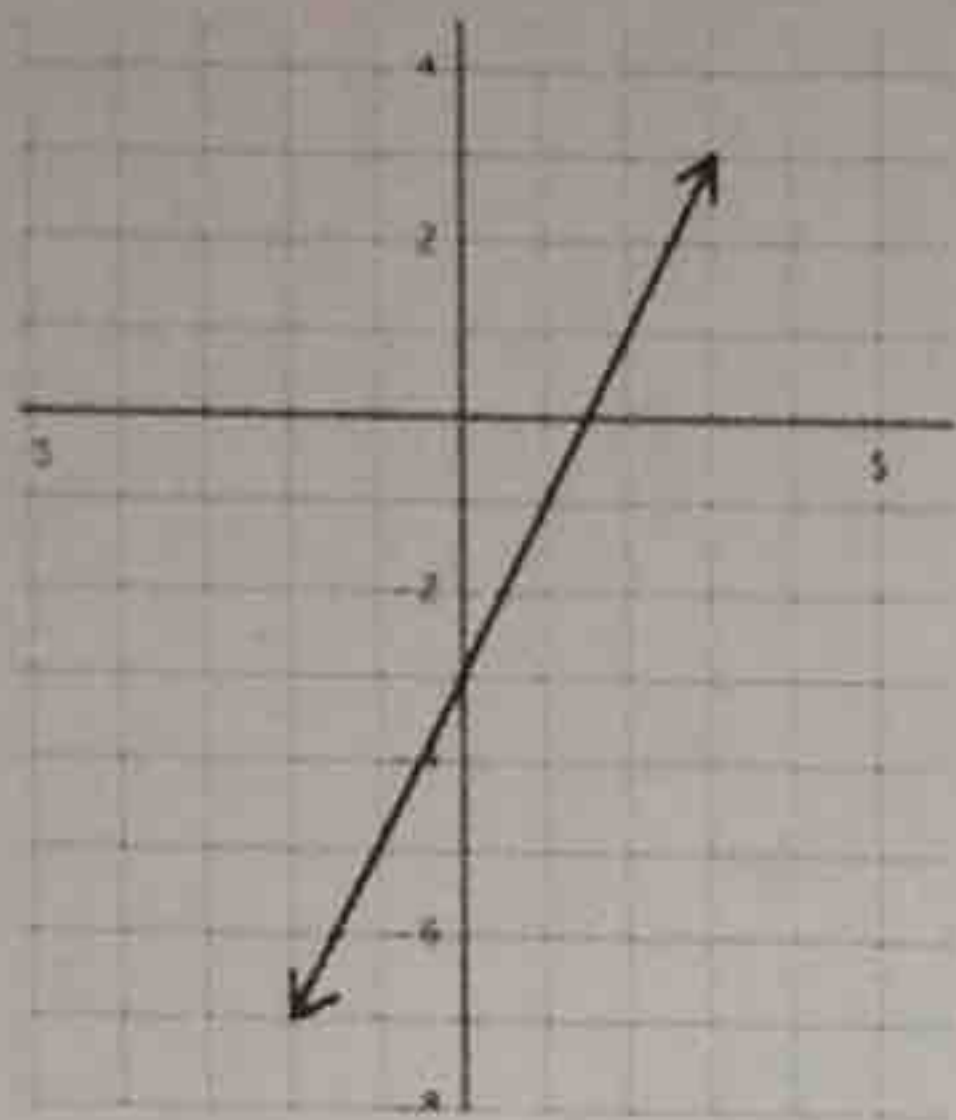
16. $h(x)$

17. Which function above has a relative maximum value?

17. $h(x)$

Directions: Determine the end behavior.

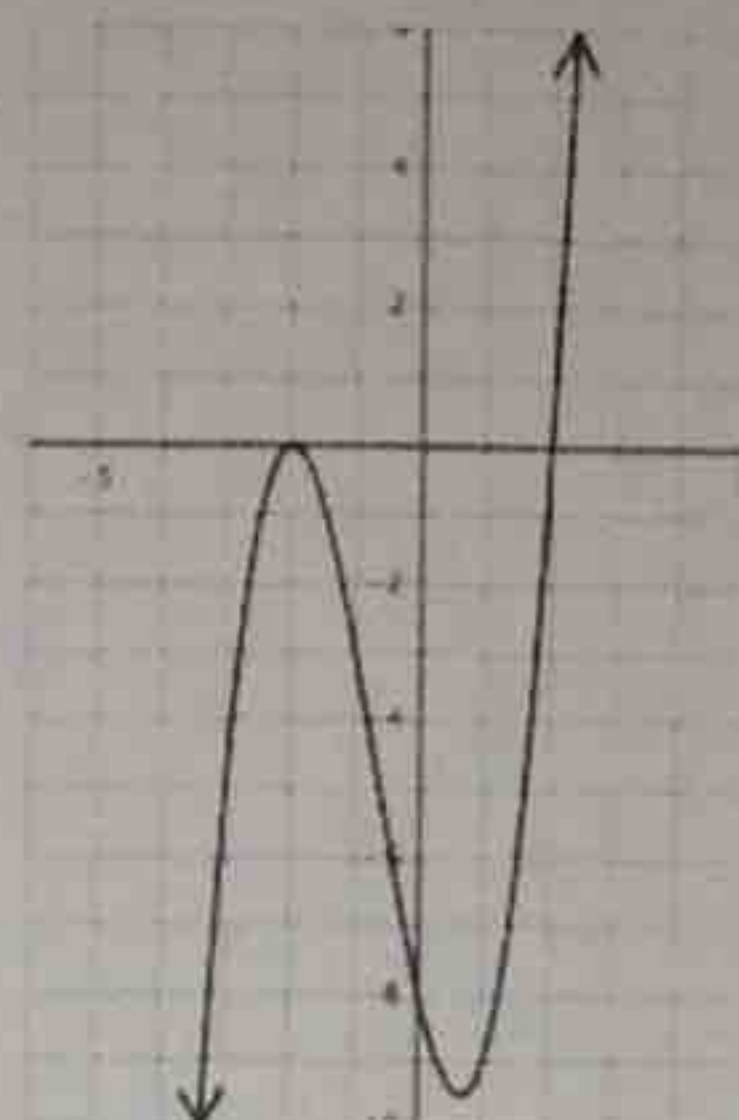
18.



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

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

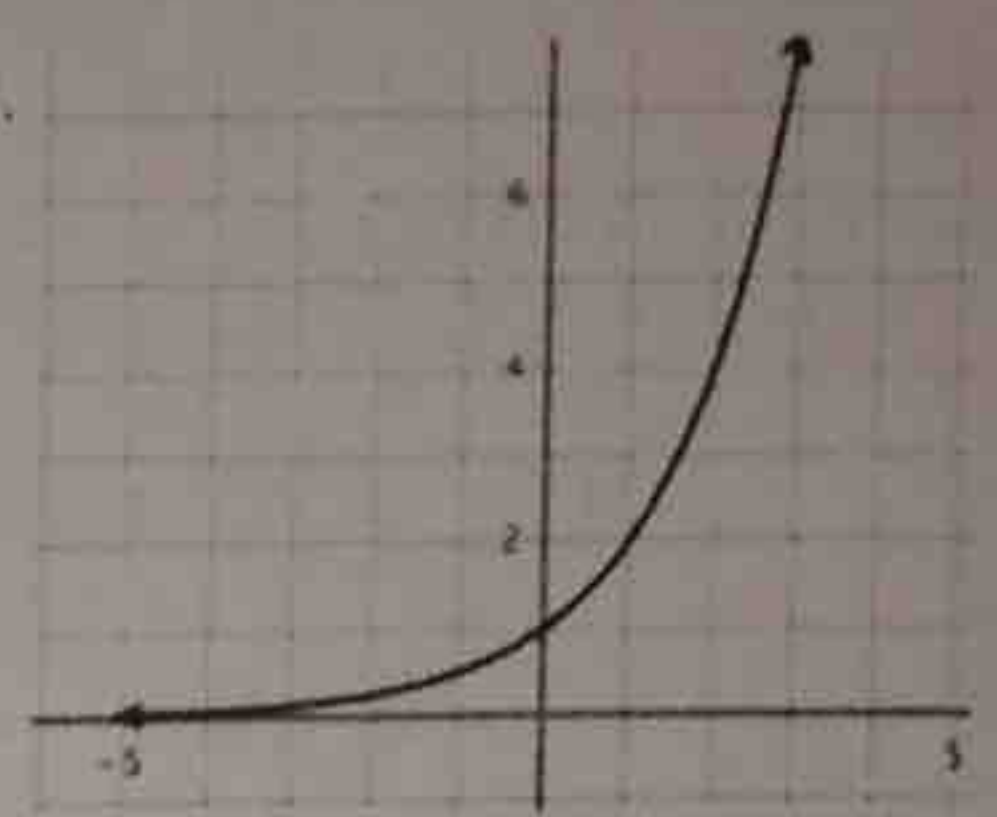
19.



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

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

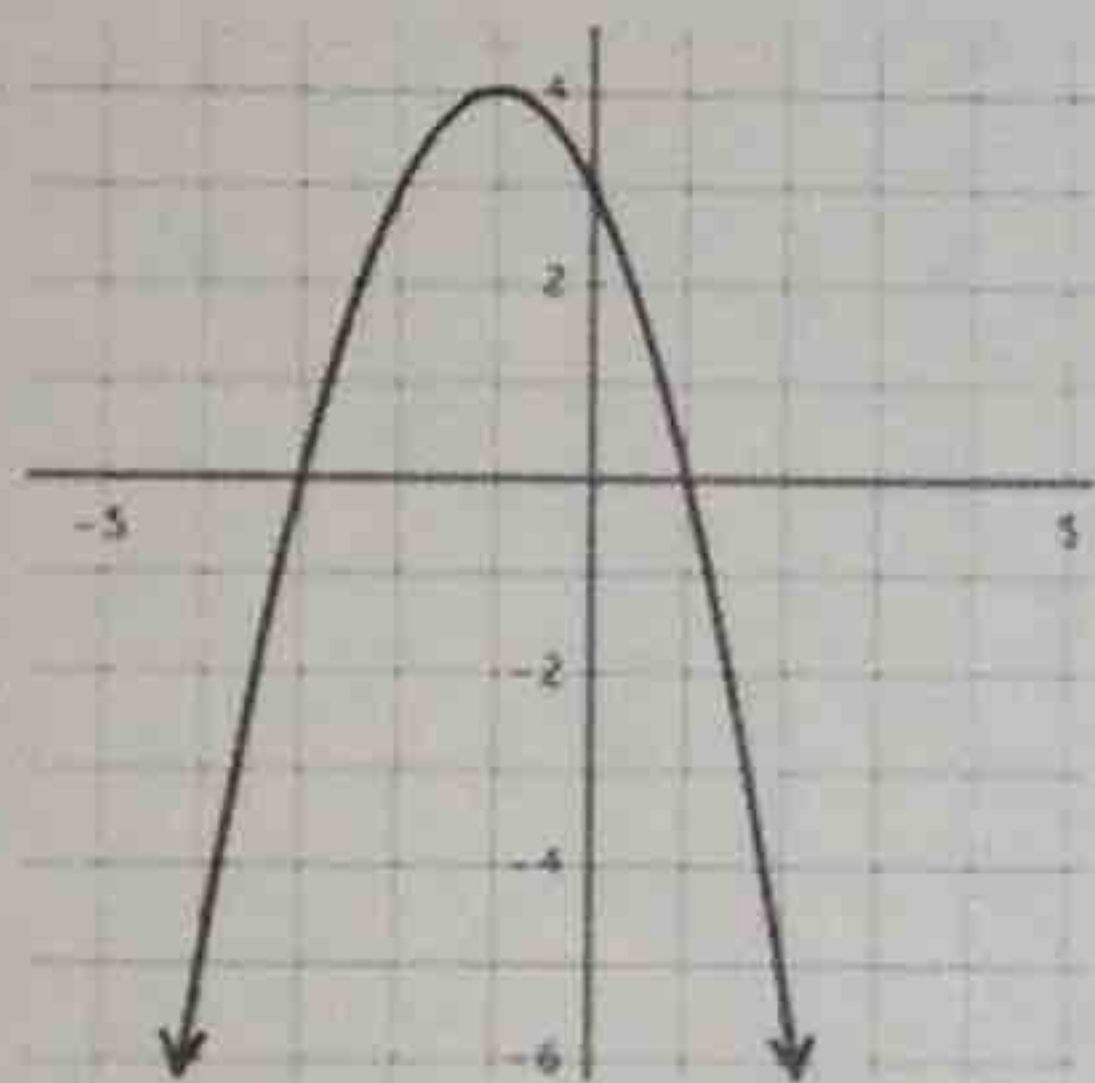
20.



$$x \rightarrow -\infty, f(x) \rightarrow 0$$

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

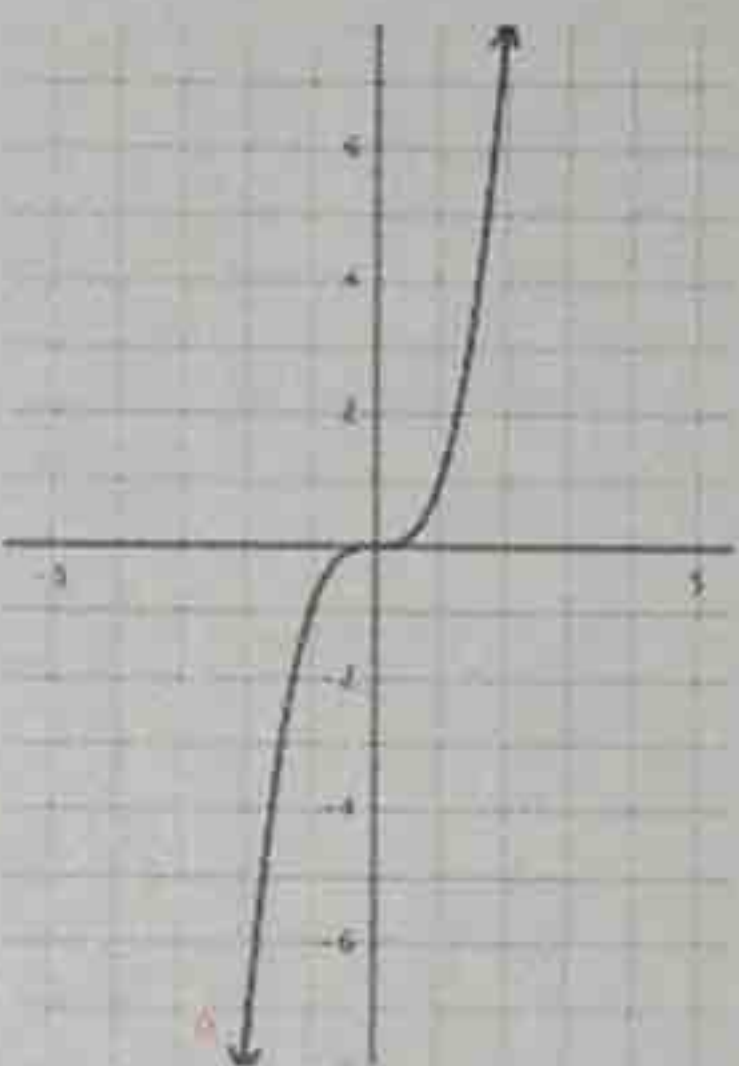
21.



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

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

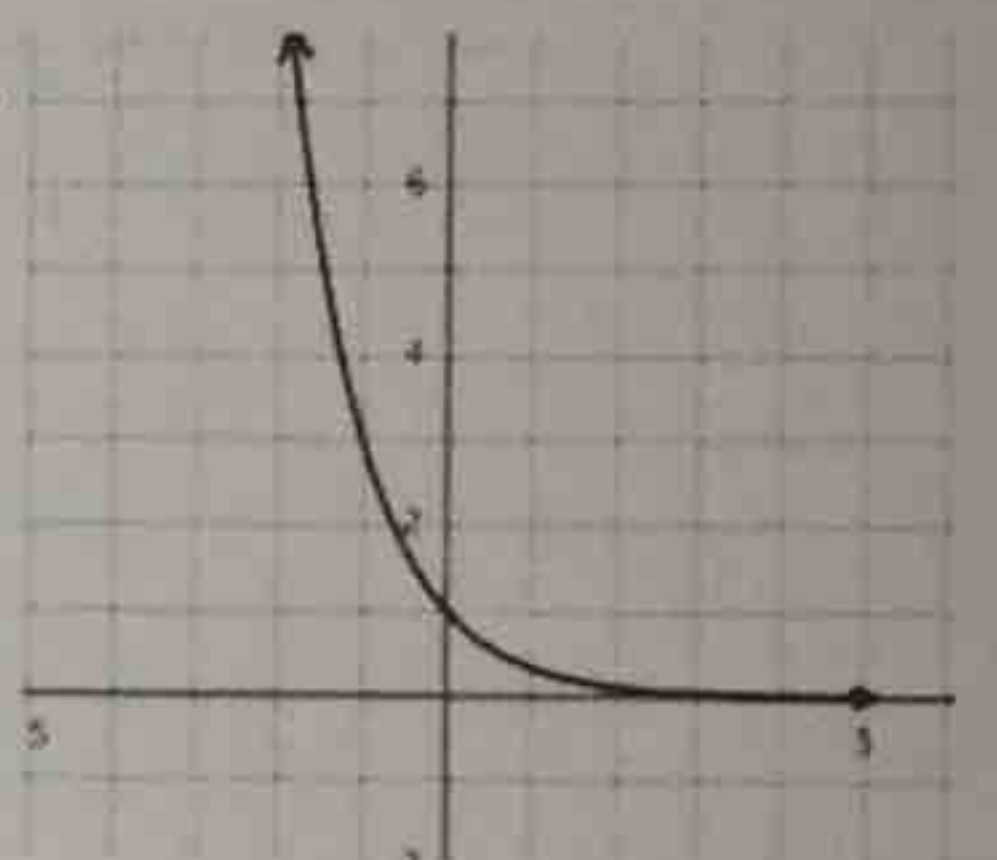
22.



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

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

23.



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

$$x \rightarrow \infty, f(x) \rightarrow 0$$

Review: Solve for x.

24. $x^2 - 16 = 0$

$$(x-4)(x+4) = 0$$

$$x-4=0 \quad x+4=0$$

$$x=4 \quad x=-4$$

$$\{-4, 4\}$$

25. $x^2 + 4x + 3 = 0$

$$(x+3)(x+1) = 0$$

$$x+3=0 \quad x+1=0$$

$$x=-3 \quad x=-1$$

$$\{-3, -1\}$$

26. $x^2 - 5x + 6 = 0$

$$(x-2)(x-3) = 0$$

$$x-2=0 \quad x-3=0$$

$$x=2 \quad x=3$$

$$\{2, 3\}$$

27. $x^2 + 4x = 12$

$$x^2 + 4x - 12 = 0$$

$$(x+6)(x-2) = 0$$

$$x=-6 \quad x=2$$

$$\{-6, 2\}$$

28. $(x+4)(x-3)(x+1) = 0$

$$x+4=0 \quad x=-4$$

$$x-3=0 \quad x=3$$

$$x+1=0 \quad x=-1$$

$$\{-4, -1, 3\}$$

29. $x(x^2 - 6x + 9) = 0$

$$x(x-3)(x-3) = 0$$

$$x=0 \quad x-3=0 \quad x-3=0$$

$$x=0 \quad x=3 \quad x=3$$

$$\{0, 3\}$$