

Instructor: Ann Clifton

Name: _____

Answer the following questions. *You must show your work to receive full credit.* Be sure to make reasonable simplifications. Give exact answers. Indicate your final answer with a box.

Fill in the blank with the correct term. If there is more than one blank, you must get each correct to receive credit.

1. A relation is a function if each input corresponds to exactly one output.
2. Let $y = f(x)$. The value $f(b) - f(a)$ is called the net change from $x = a$ to $x = b$.
3. Given the graph of an equation, we can determine whether the equation is a function by using the vertical line test.
4. The set of all inputs for a function is called the domain. The set of all outputs is called the range.
5. The function f is increasing on an interval I if $f(a) < f(b)$ whenever $a < b$ in I . The function f is decreasing on an interval I if $f(a) > f(b)$ whenever $a < b$ in I .
6. The function value $f(a)$ is a local maximum of f if $f(a) \geq f(x)$ for values of x near a . The function value $f(b)$ is a local minimum of f if $f(b) \leq f(x)$ for values of x near b .
7. The average rate of change of the function $y = f(x)$ between $x = a$ and $x = b$ is $\frac{f(b) - f(a)}{b - a}$.
8. A linear function is a function of the form $f(x) = mx + b$. The graph of f is a line where m is the slope and b is the y-intercept.
9. The equation $y - y_1 = m(x - x_1)$ is called the point-slope form of the equation of a line. The equation $y = mx + b$ is the slope-intercept form of the equation of a line.

10. Two lines $y = m_1x + b_1$ and $y = m_2x + b_2$ are called **parallel** if $m_1 = m_2$ and **perpendicular** if $m_1 = -\frac{1}{m_2}$.
11. The variable y is **directly proportional** to the variable x if x and y are related by an equation of the form $y = kx$. The constant k is called the constant of proportionality.
12. The **equilibrium point** is the point of intersection of the graphs of the supply and demand equations.
13. A function of the form $f(x) = Ca^x$ models exponential **growth** if $a > 1$ and models exponential **decay** if $0 < a < 1$. The constant C is the **initial value** of f (the value when $x = 0$).
14. For an exponential growth model, the growth factor a is greater than 1. The **growth rate**, r , is positive and satisfies the equation $r = a - 1$.
15. For an exponential decay model, the decay factor a is a positive number less than 1. The **decay rate**, r , is a negative number and satisfies the equation $r = a - 1$.

Solve the following.

16. Let $f(x) = x^2 - 3x + 2$.
a. Find the net change of f from $x = 2$ to $x = 5$.

$$f(5) - f(2) = 12$$

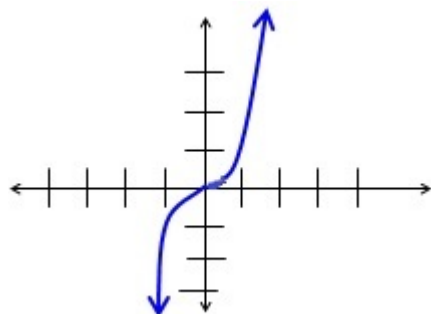
- b. Find the average rate of change from $x = 2$ to $x = 5$.

$$\frac{f(5) - f(2)}{5 - 2} = 4$$

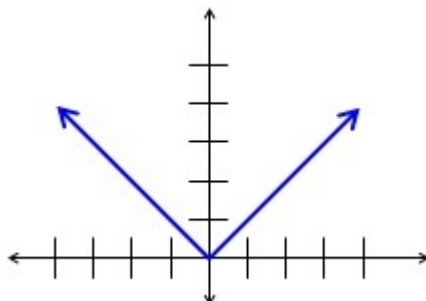
17. Match the following functions with their graphs:

a. $f(x) = |x|$ **II**, **b.** $f(x) = x^3$ **I**, **c.** $f(x) = x^2$ **III**, **d.** $f(x) = \sqrt{x}$ **IV**

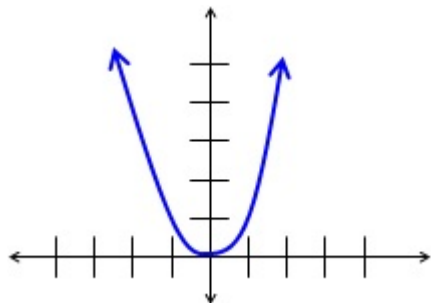
I.



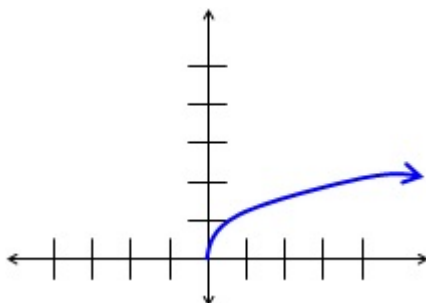
II.



III.



IV.



18. Find the equation of the line that passes through the point $(-2, 5)$ and is perpendicular to the line $2x - 4y = 7$.

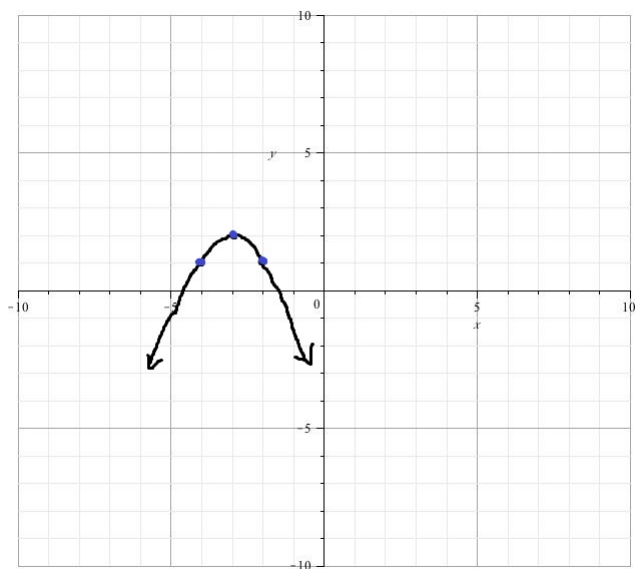
$$y - 5 = -2(x + 2) \text{ or } y = -2x + 1$$

19. Find the equation of the line that passes through the point $(1, 2)$ is parallel to the line passing through $(7, 3)$ and $(-1, 7)$.

$$y - 2 = -\frac{1}{2}(x - 1) \text{ or } y = -\frac{1}{2}x + \frac{5}{2}$$

20. Graph the following function. Plot at least three points on the graph.

$$f(x) = -(-x - 3)^2 + 2$$



21. A hot air balloon is being filled. The linear equation $V = 0.05t + 5$ models the volume V (in cubic feet) of hydrogen in the balloon at any time t (in seconds). How many minutes will it take until the balloon contains $57ft^3$ of hydrogen? (Round your answer to one decimal place.)

17.3 minutes

22. Determine where, and if, the following two lines intersect: $y = \frac{-1}{2}x + 5$, $3x - y = 9$.

$(4, 3)$

23. A population P is initially 550. Find an exponential growth model in terms of the number of time periods x if in each time period the population P decreases by 4%.

$$P(x) = 550(.96)^x$$