

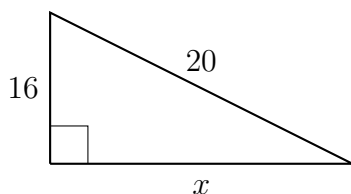
Math 101 Review on Graphs and Geometry

Learning Goals

- (GR-1) Distances, midpoints, and geometric shapes
I know the distance formula and can apply it when appropriate. I know the midpoint formula and can apply it when appropriate. I know and can apply geometry formulas related to squares, triangles, circles, boxes, spheres, and right circular cylinders. I can use the Pythagorean Theorem and its converse.
- (GR-2) Graphs of equations, intercepts and symmetry
I can test an equation for symmetry with respect to the x -axis, the y -axis, and the origin. I can identify symmetry from a graph or complete a graph so that it has a given type of symmetry. I can quickly and accurately graph each of the following basic equations, describing any intercepts or symmetry: $y = x^2$, $y = x^3$, $y = x$, $y = \frac{1}{x}$, $y = \sqrt{x}$, $x = y^2$, $y = |x|$. I can graph functions of the form $f(x) = k$, $f(x) = x$, $f(x) = x^2$, $f(x) = \sqrt{x}$, $f(x) = \sqrt[3]{x}$, $f(x) = \frac{1}{x}$, and $f(x) = |x|$. I can graph piecewise-defined functions and I can determine the equation given the graph of a piecewise-defined function.
- (GR-3) Graphs of lines and systems of lines
I can find the equation of a line given its slope and a point. I can find the equation of a line given its slope and its y -intercept. I can find the equation of a line given two points on the line. I can find equations of parallel lines and perpendicular lines. I can write the equation of a line in slope-intercept form, standard form, and point-slope form. I can graph a line. I can identify the slope and y -intercept of a line from its equation or graph. I can solve systems of linear equations in two variables by substitution and I can solve systems of linear equations in two variables by elimination. I can identify inconsistent systems of equations in two variables and I can express the solution of a system of dependent equations containing two variables.
- (GR-4) Circles
I can convert between standard form and expanded form for the equation of a circle. Given its properties, I can graph a circle and find its equation. I can find x -intercepts and y -intercepts found on the graph of a circle.

Review Problems

1. For the following right triangle, find the side of length x . Simplify your answer.



2. Find the exact area of a circle of radius 5 feet.
3. Graph the line $x - y = -4$.
4. Graph the line with slope -1 passing through the point $(-1, -2)$.

5. Graph the line with slope $m = -3$ and y -intercept $b = -1$.
6. Find an equation for the line going through $(-1, -1)$ and $(3, 1)$.
7. A line passes through the point $(2, -4)$ and has a slope of 4. Write an equation in point-slope form for this line.
8. Calculate the distance between the points $F = (1, -6)$ and $J = (7, -1)$ in the coordinate plane. Give an exact answer.
9. Find the slope, the x -intercept(s), and the y -intercept(s) of the line $5x + 3y = -12$. Write the line's equation in slope-intercept form.
10. Find the midpoint M of the line segment joining the points $A = (-7, 6)$ and $B = (-1, -4)$.
11. Consider the line $4x - 7y = -8$.
 - (a) Find the equation of the line that is **perpendicular** to this line and passes through the point $(4, -4)$.
 - (b) Find the equation of the line that is **parallel** to this line and passes through the point $(4, -4)$.
12. Find an equation of the circle that has center $(-2, -6)$ and passes through $(2, 2)$.
13. Find the slope and the y -intercept of the line $8x - 4y = 7$. Simplify your answers.
14. Write equations for the vertical and horizontal lines passing through the point $(-4, 3)$.
15. For each pair of points, find the slope of the line passing through them. If the slope is undefined, write "undefined." Simplify your answers.
 - (a) $(-7, 6)$ and $(-9, 8)$
 - (b) $(-5, 2)$ and $(6, 2)$
 - (c) $(-5, 4)$ and $(-5, -5)$
16. The equation of a circle is $x^2 + y^2 - 8x + 2y = -13$. Identify its radius and center.
17. Find an equation of the circle whose diameter has endpoints $(-6, -4)$ and $(2, -1)$.
18. For each ordered pair below, determine whether it is a solution to the system of equations.

	(x, y)	Yes	No
$\begin{cases} y = 2x + 8 \\ 4x - 2y = -16 \end{cases}$	$(0, -7)$		
	$(5, -3)$		
	$(-3, 2)$		
	$(5, 18)$		

19. Solve each system.

(a)
$$\begin{cases} 3x + 2y = -6 \\ x - 3y = -13 \end{cases}$$

(b)
$$\begin{cases} -9x - 5y = 4 \\ -4x - 9y = -5 \end{cases}$$

(c)
$$\begin{cases} x - 4y = -8 \\ 4y = x + 8 \end{cases}$$

(d)
$$\begin{cases} -x + 2y = -4 \\ x - 2y = -4 \end{cases}$$

20. Identify the center and radius of the circle $x^2 + y^2 - 4x + 6y = -3$. Also, find the x -intercept(s) and the y -intercept(s) found on its graph, if any.
21. Determine whether the equation has a graph that is symmetric with respect to the y -axis, the x -axis, the origin, or none of these.

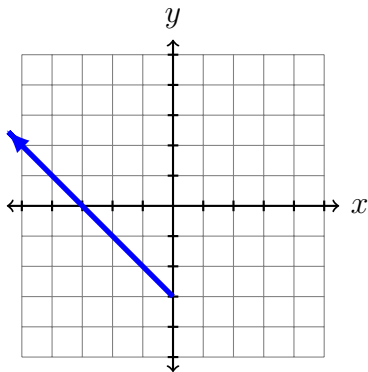
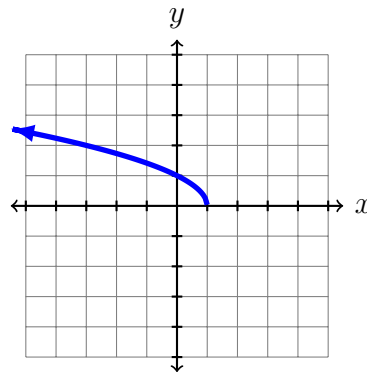
(a) $y = 3x^2 + 4$

(b) $x^2 - y^2 = 4$

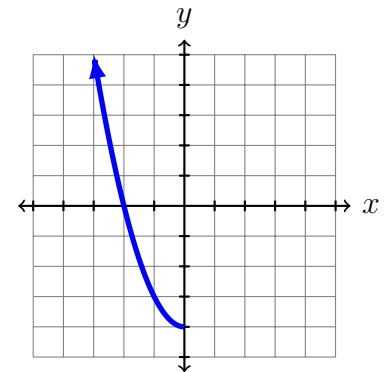
(c) $y = (x - 6)(x - 6)$

(d) $x = y^2 - 16$

22. Draw a complete graph so that it has the type of symmetry indicated.

(a) y -axis(b) x -axis

(c) origin



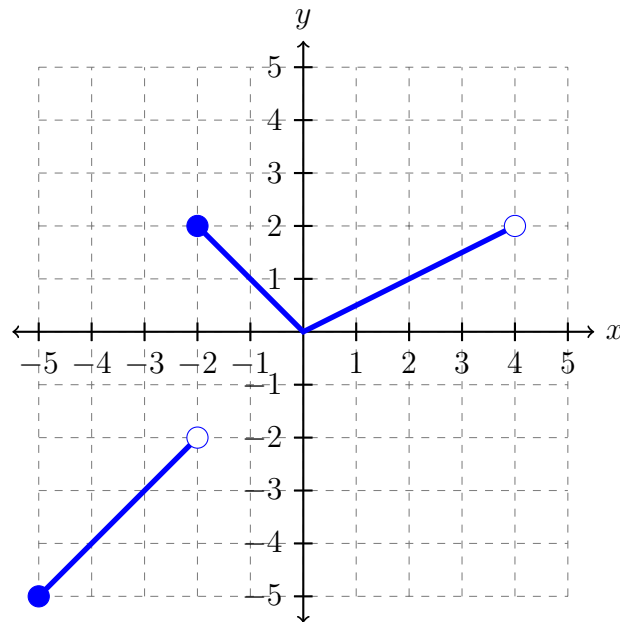
23. Find $f(0)$, $f(8)$, and $f(11)$, where $f(x)$ is the piecewise-defined function

$$f(x) = \begin{cases} 8x + 1, & \text{if } x < 1 \\ 8x, & \text{if } 1 \leq x < 11 \\ 8 - 5x, & \text{if } x \geq 11 \end{cases}$$

24. Graph the function $f(x) = \begin{cases} -3, & \text{if } x \geq 1 \\ -5 - x, & \text{if } x < 1 \end{cases}$

25. Graph the function $f(x) = \begin{cases} x^3, & \text{if } x < 1 \\ -2 + x, & \text{if } x \geq 2 \end{cases}$

26. The graph of a piecewise-defined function is given. Write its equation.

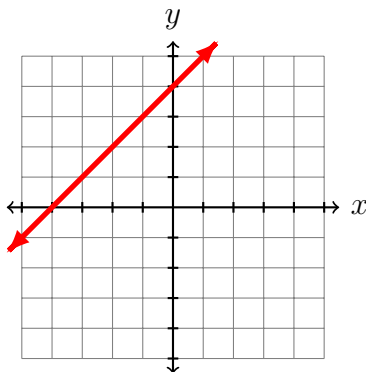


Answers

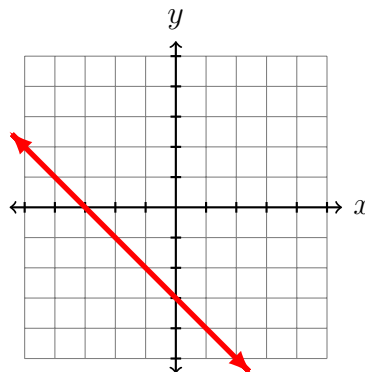
1. $x = 12$

2. Area: 25π square feet

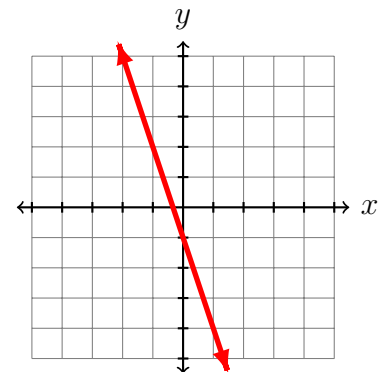
3. $y = x + 4$



4. $y = -1x - 3$



5. $y = -3x - 1$



6. $y = \frac{1}{2}x - \frac{1}{2}$

12. $(x + 2)^2 + (y + 6)^2 = 80$

7. $y + 4 = 4(x - 2)$

13. slope: $m = 2$, int: $b = -7/4$

8. $\sqrt{61}$

14. vertical: $x = -4$, horizontal: $y = 3$

9. x -int: $(\frac{12}{5}, 0)$, y -int: $(0, 4)$, $y = -\frac{5}{3}x + 4$

15. (a) $m = -1$, (b) $m = 0$, (c) undefined

10. $M = (-4, 1)$

16. $r = \sqrt{30}$, $C = (4, -1)$

11. (a) $7x + 4y = 12$, (b) $4x - 7y = 44$

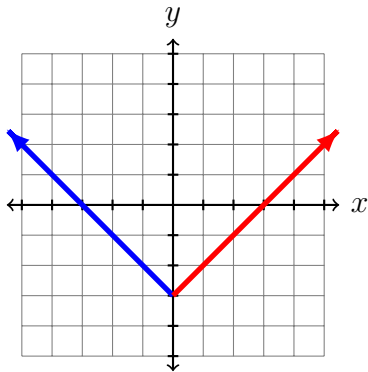
17. No, no, yes, yes

18. (a) $(-4, 3)$, (b) $(-1, 1)$, (c) $(t, \frac{1}{4}t + 2)$ where t is any number, (d) No solution

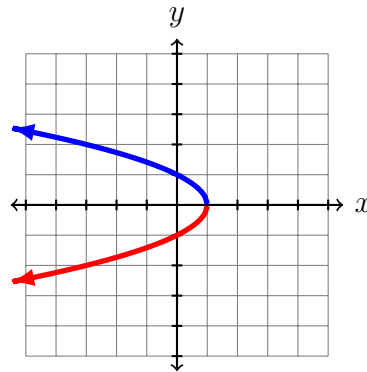
19. Center: $C = (2, -3)$, radius: $r = \sqrt{10}$. x -int: $(1, 0)$, $(3, 0)$, y -int: $(0, -3 \pm \sqrt{6})$

20. (a) y -axis, (b) x -axis, y -axis, origin, (c) none, (d) x -axis

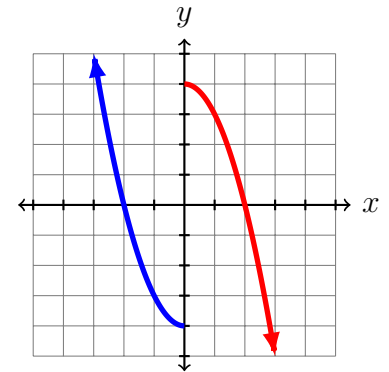
21. (a) y -axis



(b) x -axis



(c) origin



Graphs:

22. $f(0) = 1$, $f(8) = 64$, $f(11) = -47$

23. Graph the function $f(x) = \begin{cases} -3, & \text{if } x \geq 1 \\ -5 - x, & \text{if } x < 1 \end{cases}$. Graph the function $f(x) = \begin{cases} x^3, & \text{if } x < 1 \\ -2 + x, & \text{if } x \geq 2 \end{cases}$

