In addition to these sample problems, any problems that have been assigned for homework or on a quiz are fair game for the test!

Graph each of the given equations, state the domain and range, and specify all intercepts and symmetry.

1. \( y = 9 - x^2 \)

   
   
   
   Domain: Range: 
   
   \( x \)-intercept(s): \( y \)-intercept(s): 
   
   symmetry: 

2. \( y = x^3 - 4x \)

   
   
   
   Domain: Range: 
   
   \( x \)-intercept(s): \( y \)-intercept(s): 
   
   symmetry: 

3. \( y = \sqrt{x} - 5 \)

   
   
   
   Domain: Range: 
   
   \( x \)-intercept(s): \( y \)-intercept(s): 
   
   symmetry: 

4. \( y = |3x| - 4 \)

   
   
   
   Domain: Range: 
   
   \( x \)-intercept(s): \( y \)-intercept(s): 
   
   symmetry: 

5. Which of the equations in 1-4 above represent functions? Are any of them even or odd functions?

Draw a qualitative graph for each of the following situations. Be sure to label both axes.

6. The level of the water in a bathtub is related to the time from before it is run until after the bather is finished bathing.
7. The distance from Los Angeles a person is who is flying from New York City to L.A. is related to the time since they left NYC.

Determine whether or not each of the following relations represents a function and give the domain and range of each.

8. \{ (4, 0), (3, -5), (7, 1), (4, -2) \}  
9. \{ (3, 5), (2, 5), (1, 5), (0, 5) \}

Determine the domain of each function.

12. \( f(x) = x^2 - 1 \)  
13. \( g(x) = \frac{1}{x+7} \)  
14. \( h(x) = \sqrt{3x+12} \)

15. \( j(x) = \frac{1}{x^2 - 1} \)  
16. \( k(x) = \frac{\sqrt{x+2}}{x-7} \)  
17. \( m(x) = \sqrt{6 - 2x} \)

Evaluate each function as indicated.

18. Given \( f(x) = x^2 + 2x - 3 \), find \( a)\) \( f(5) \)  \( b)\) \( f(0) \)  \( b)\) \( f(x + h) \)

19. Given \( f(x) = \begin{cases} 2x + 7, & \text{if } x < 0 \\ 3 - x^2, & \text{if } x \geq 0 \end{cases} \), find each of the following. Then graph the function and state its domain and range.

\( a)\) \( f(-4) \)
\( b)\) \( f(0) \)
\( c)\) \( f(5) \)

Domain: \( \)  Range: \( \)
20. Given the graph of \( f(x) \) below, find  
   a) \( f(-4) \)  
   b) \( f(0) \)  
   c) \( f(5) \)

Find and simplify the difference quotient \( \frac{f(x+h) - f(x)}{h} \) for each function below. Show work!

21. \( f(x) = 7x - 1 \)  
22. \( f(x) = x^2 - 5x + 2 \)

23. Use the function graphed below to give intervals on which it is a) increasing, b) decreasing, and c) constant. Also, state d) the local maximum point(s), and e) the local minimum point(s).

Determine whether each of the following equations represents an even function, an odd function, or neither.

24. \( f(x) = 6x^3 - 4x \)  
25. \( f(x) = x^2 + 4x \)  
26. \( f(x) = 3x^2 - 7 \)

Find the equation of the line in slope-intercept form (if possible) which satisfies the given conditions.

27. It passes through the points (5, 1) and (3, -7).

28. It is parallel to \( 4x - 3y = 12 \) and passes through (0, 5).

29. It is perpendicular to \( y = \frac{1}{3}x + 7 \) and passes through (2, 1).
30. It is parallel to the $x$-axis and passes through $(4, -5)$.

31. It has undefined slope and passes through $(3, 1)$.

32. It has $x$-intercept 5 and $y$-intercept 7.

33. Suppose a car is valued at $35,500 when it is brand new, and that when it is 4 years old, its value is only $14,000. Express the value of the car as a linear function of time.

State the slope and $y$-intercept of each line whose equation is given. Then graph each line.

34. $2x - 3y = 12$

35. $y = 5$

36. $y = x$

Find the average rate of change of each function from $x_1$ to $x_2$.

37. $f(x) = x^2 + 6x$ from $x_1 = -3$ to $x_2 = 2$.

38. $f(x) = \sqrt{x + 3}$ from $x_1 = 1$ to $x_2 = 6$.

39. Describe how the graph of each transformation below would differ from the graph of $f(x)$.
   a) $3f(x) + 4$
   b) $-f(x + 7)$
   c) $f(-3x)$

Graph each function below as a transformation of a common function.

40. $f(x) = -(x - 3)^2 + 1$

41. $g(x) = \sqrt{-x + 5}$
42. \( y = \frac{1}{2} x^3 - 2 \)

43. \( y = |x + 4| - 3 \)

44. Given \( f(x) = x^2 - 5 \) and \( g(x) = 9 - x^2 \), find a) \( f + g \), b) \( f - g \), c) \( fg \), d) \( \frac{f}{g} \), and e) \( f \circ g \), and state the domain of each.

45. Given \( f(x) = \sqrt{2x - 6} \) and \( g(x) = \sqrt{10 - x} \), find a) \( f + g \), b) \( fg \), c) \( \frac{f}{g} \), and d) \( g \circ f \), and state the domain of each.

46. Given \( f(x) = 2x - 7 \) and \( g(x) = \sqrt{x + 11} \), find each of the following in simplest form and state their domains.

   a) \( (f \circ g)(x) \)
   b) \( (g \circ f)(x) \)

47. Using the functions from #46, find each of the following.

   a) \( (f \circ g)(5) \)
   b) \( (g \circ f)(5) \)
   c) \( (f \circ g)(0) \)
   d) \( (g \circ f)(0) \)

48. Decompose each of the given functions, given that \( h(x) = (f \circ g)(x) \).

   a) \( h(x) = (4x + 3)^3 \)
   b) \( h(x) = \frac{6}{2x - 1} \)
   c) \( h(x) = |3x - 5| \)
49. Tell whether or not each function below is one-to-one.

   a) \( y = x^3 - 2 \)  
   b) \( y = |x + 3| \)  
   c) \( y = x \)

50. Determine whether or not \( f(x) \) and \( g(x) \) below are inverses by finding \((f \circ g)(x)\). Show your work!

   a) \( f(x) = 5x - 7 \); \( g(x) = \frac{1}{5}x + 7 \)  
   b) \( f(x) = \sqrt[3]{2x + 3} \); \( g(x) = \frac{x^3 - 3}{2} \)

For each of the following functions, find a) the domain and range, b) the inverse function, and c) the domain and range of the inverse function. Show your work.

51. \( f(x) = \sqrt{x + 5} \)
52. \( f(x) = 2x - 9 \)
53. \( f(x) = \frac{5x - 3}{3x - 6} \)

54. Given the graph of \( f(x) \), draw the graph of \( f^{-1}(x) \) on the same grid.

55. Given the points (2, 9) and (-2, 15), find the (a) distance between them, and (b) midpoint of the line segment joining them.

Give the standard form of the equation of each of the circles, based on the information provided.

56. center: (-5, 2); radius 9  
57. center: (0, 0); passing through (3, -7)
58. State the center and radius of the circle whose equation is given and then graph it on the grid provided. Then use the graph to state the domain and range of the circle.

\[ x^2 + (y - 3)^2 = 16 \]

Center: \[ \text{ } \]
Radius: \[ \text{ } \]
Domain: \[ \text{ } \]
Range: \[ \text{ } \]

Write each equation in standard form by completing the square, then state the center and the radius. Show your work!

59. \[ x^2 + y^2 - 6x + 10y - 7 = 0 \]
60. \[ x^2 + y^2 + 4x - 2y + 3 = 0 \]

61. A diameter of a circle has endpoints at (7, 2) and (3, -4).
   a) Determine the center of the circle.
   b) Determine the radius of the circle.
   c) Determine the equation of the circle in standard form.

62. You have 300 feet of fencing to enclose a rectangular field. Express the area of the field, \( A \), as a function of the width of the field, \( x \).

63. An open box is formed from a square piece of cardboard 20 inches on a side by cutting identical squares from the corners and turning up the sides.
   a) Express the volume of the box, \( V \), as a function of the length of the side of the square cut from each corner, \( x \).
   b) Find and interpret \( V(10) \).
   c) Determine the domain of the function.
   d) Determine the dimensions which would maximize the volume.