1. Given \( y = 9 - x^2 \), use the calculator to
   a) graph the equation.
   b) find the y-intercept.
   c) find the x-intercepts.
   d) Is this a function?
   e) Is this a one-to-one function?

2. Given \( x^2 + y^2 = 25 \),
   a) graph the circle using the calculator.
   b) What equations were used to graph the circle?
   c) State the domain and range.

3. Find the equation of the line that passes through (-1, 2) and (5, -3).

4. Find the equation of the line that passes through the point (-4, 7) and is perpendicular to \( 2x + 3y = 4 \).

5. State the domain of each of the following:
   a) \( f(x) = \frac{5x}{3x - 12} \)
   b) \( g(x) = -3x^2 + 7x - 4 \)
   c) \( h(x) = \sqrt{x} - 5 \)

6. Given \( f(x) = \begin{cases} x^2 + 5x, & x < 2 \\ \frac{4x-1}{3x+2}, & 2 \leq x \leq 5 \\ \sqrt{2x-3}, & x > 5 \end{cases} \), find
   a) \( f(-3) \)
   b) \( f(15) \)
   c) \( f(5) \)
7. Given \( y = -4|x - 3| + 2 \), use the calculator to
   a) graph the equation.
   b) find the domain and range.
   c) Is this a function?
   d) Find the intervals where the function increases or decreases.
   e) Is this a one-to-one function?

8. Determine whether each function is odd, even, or neither.
   a) \( f(x) = 5x^3 - 2x \)
   b) \( f(x) = x^4 - 3x^2 + 5 \)

9. Given \( f(x) = \sqrt{x - 1} \) and \( g(x) = 3x^2 + 5 \), find
   a) \((f - g)(5)\)
   b) \((g \circ f)(x)\)
   c) \((f \circ g)(2)\)

10. Verify that \( f(x) = x^2 - 4 \), \( x \geq 0 \), is a one-to-one function, then find its inverse.

11. Are \( f(x) = 2x - 3 \) and \( g(x) = \frac{x+3}{2} \) inverses of each other? (Use \((f \circ g)(x)\) and \((g \circ f)(x)\) to justify your answer.)
Solutions

1. Given \( y = 9 - x^2 \), use the calculator to
   a) graph the equation.

   ![Graph of the equation](image)

   b) find the y-intercept. \((0, 9)\)

   c) find the x-intercepts. \((-3, 0)\) and \((3, 0)\)

   d) Is this a function? Yes (vertical line test)

   e) Is this a one-to-one function? No (horizontal line test)

2. Given \( x^2 + y^2 = 25 \),
   a) graph the circle using the calculator.

   ![Graph of the circle](image)

   b) What equations were used to graph the circle?

   ![Equations used for graphing the circle](image)

   c) State the domain and range.

   Domain: \([-5, 5]\) ; Range: \([-5, 5]\)
3. Find the equation of the line that passes through \((-1, 2)\) and \((5, -3)\).

\[
y - y_1 = m(x - x_1) \quad m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 2}{5 - (-1)} = -\frac{5}{6}
\]

\[
y - 2 = -\frac{5}{6}(x - (-1))
\]

\[
y - 2 = -\frac{5}{6}(x + 1)
\]

\[
y - 2 = -\frac{5}{6}x - \frac{5}{6}
\]

\[
y = -\frac{5}{6}x + \frac{7}{6}
\]

4. Find the equation of the line that passes through the point \((-4, 7)\) and is perpendicular to \(2x + 3y = 4\).

\[
y - y_1 = m(x - x_1) \quad 2x + 3y = 4
\]

\[
3y = -2x + 4
\]

\[
y = -\frac{2}{3}x + \frac{4}{3} \quad \text{so} \quad m_\perp = -\frac{2}{3}
\]

\[
y - 7 = \frac{3}{2}(x + 4)
\]

\[
y - 7 = \frac{3}{2}x + 6
\]

\[
y = \frac{3}{2}x + 13
\]

5. State the domain of each of the following:

a) \(f(x) = \frac{5x}{3x - 12}\)

\[
3x - 12 = 0
\]

\[
x = 4
\]

Domain: All Reals, except \(x = 4\)

\((-\infty, 4) \cup (4, \infty)\)

b) \(g(x) = -3x^2 + 7x - 4\)

Domain: All Reals \((-\infty, \infty)\)

(true for all polynomials)

c) \(h(x) = \sqrt{x - 5}\)

\[
x - 5 \geq 0
\]

\[
x \geq 5
\]

Domain: All Reals where \(x \geq 5\)

\([5, \infty)\)
6. Given \( f(x) = \begin{cases} 
\frac{4x-1}{3x+2}, & 2 \leq x \leq 5, \\
\sqrt{2x-3}, & x > 5 
\end{cases} \), find

a) \( f(-3) = (-3)^2 + 5(-3) = 9 - 15 = -6 \)

b) \( f(15) = \frac{3}{\sqrt{2(15)} - 3} = \frac{3}{\sqrt{27}} = 3 \)

c) \( f(5) = \frac{4(5)-1}{3(5)+2} = \frac{19}{17} \)

7. Given \( y = -4|x - 3| + 2 \), use the calculator to

a) graph the equation.

b) find the domain and range.

From the graph Domain: All Reals; Range: \((-\infty, 2]\)

c) Is this a function? Yes (vertical line test)

d) Find the intervals where the function increases or decreases.

From the graph Increasing: \((-\infty, 3); \) Decreasing: \((3, \infty)\)

e) Is this a one-to-one function? No (horizontal line test)

8. Determine whether each function is odd, even, or neither.

a) \( f(x) = 5x^3 - 2x \)

\( f(-x) = 5(-x)^3 - 2(-x) = -5x^3 + 2x = -f(x) \)

Since \( f(-x) = -f(x) \) \( f \) is an ODD function.

b) \( f(x) = x^4 - 3x^2 + 5 \)

\( f(-x) = (-x)^4 - 3(-x)^2 + 5 = x^4 - 3x^2 + 5 = f(x) \)

Since \( f(-x) = f(x) \) \( f \) is an EVEN function.
9. Given \( f(x) = \sqrt{x - 1} \) and \( g(x) = 3x^2 + 5 \), find

a) \( (f - g)(5) = f(5) - g(5) \)
   \[ = \sqrt{5 - 1} - (3(5)^2 + 5) \]
   \[ = \sqrt{4} - 80 = 2 - 80 = -78 \]

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

c) \( (f \circ g)(2) = f(g(2)) \) where \( g(2) = 3(2)^2 + 5 = 17 \)
   \[ = f(17) \]
   \[ = \sqrt{17 - 1} = \sqrt{16} = 4 \]

10. Verify that \( f(x) = x^2 - 4, \ x \geq 0 \), is a one-to-one function, then find its inverse.

For \( x \geq 0 \) the function is one-to-one (horizontal line test).

To find the inverse:
\[ y = x^2 - 4 \] -> write function as an equation
\[ x = y^2 - 4 \] -> swap x and y
\[ y^2 = x + 4 \]
\[ y = \pm \sqrt{x + 4} \] -> solve for new y

\[ f^{-1}(x) = \sqrt{x + 4} \] Domain: \( x \geq -4 \) Range: \( y \geq 0 \)

11. Are \( f(x) = 2x - 3 \) and \( g(x) = \frac{x+3}{2} \) inverses of each other? (Use \( f \circ g)(x) \) and \( (g \circ f)(x) \) to justify your answer.)

\[ (f \circ g)(x) = f(g(x)) \]
\[ = f\left(\frac{x+3}{2}\right) \]
\[ = 2\left(\frac{x+3}{2}\right) - 3 \]
\[ = x + 3 - 3 \]
\[ = x \]

\[ (g \circ f)(x) = g(f(x)) \]
\[ = g(2x - 3) \]
\[ = \frac{(2x-3)+3}{2} \]
\[ = \frac{2x}{2} \]
\[ = x \] Yes, they are inverses.