1. State the domain and range for the graph shown below.

   Domain: \((-\infty, \infty)\)
   Range: \((-\infty, 4]\)
   Is this graph continuous? **YES**
   A local maximum occurs at what point? \((-1, 4)\)

2. Determine if each relation is a function and then determine the inverse for each.

   a) \(\{(4,3), (1,5), (-5,-3)\}\)
   b) \(\{(-5,-6), (-3,-2), (-5,-3)\}\)

   \[\{1, 4\}, (5, -1), (-3, -5)\] **NO (-5 repeats)**

3. The graph of a function \(H(t)\) is shown to the right.

   Determine each of the following:
   Domain: \([0, 4]\)
   Range: \([0, 40]\)
   Is this graph continuous? **YES**
   Find the values for the following:
   a) \(H(t) = 20\)
   b) \(H(4) = 40\)

4. The graph of \(f(x)\) is shown to the right.

   a) Find each of the following:
   \(f(0) = 0\)
   \(f(-0.5) = 2\)
   \(f(x) = 0 \Rightarrow x = 0, x = 2\)

   b) What is the domain of \(f(x)\)?
   \((-\infty, -2) \cup (-2, \infty)\)

   c) What is the range of \(f(x)\)? \((-\infty, \infty)\)

   d) Is this function discontinuous? If so, state the value for where the discontinuity exists.
   **YES** Discontinuity at \(x = -2\) (hole)
5. Determine if each graph represents a function or not. (vertical line test)

6. Complete the following table:

<table>
<thead>
<tr>
<th>Set Builder Notation</th>
<th>Interval Notation</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>x &gt; -4 } )</td>
<td>((-4, \infty))</td>
</tr>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>x \leq 5 } )</td>
<td>((-\infty, 5])</td>
</tr>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>-3 \leq x &lt; 6 } )</td>
<td>([-3, 6))</td>
</tr>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>x &lt; 6 } )</td>
<td>((-\infty, 6))</td>
</tr>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>x \leq -3 \text{ or } x &gt; 0 } )</td>
<td>((-\infty, -3] \cup (0, \infty))</td>
</tr>
<tr>
<td>( { x \in \mathbb{R}</td>
<td>0 \leq x &lt; 4 } )</td>
<td>([0, 4))</td>
</tr>
</tbody>
</table>

7. Evaluate the function for each of the following. 
\( f(x) = \begin{cases} 3x^2; & x \leq 5 \\ -x + 2; & x > 5 \end{cases} \)

a) \( f(5) = \frac{75}{2(5)^2} = \frac{75}{50} = 1.5 \)

b) \( f(8) = \frac{-6}{-8 + 2} = \frac{-6}{-6} = 1 \)

c) \( f(-3) = \frac{27}{3(-3)^2} = \frac{27}{27} = 1 \)

d) \( f(10) = \frac{-8}{-10 + 2} = \frac{-8}{-8} = 1 \)

e) \( f\left(\frac{2}{3}\right) = \frac{\frac{4}{3}}{3\left(\frac{2}{3}\right)^2} = \frac{\frac{4}{9}}{3\left(\frac{4}{9}\right)} = \frac{4}{3} \)

8. Evaluate the following expressions given the functions below:

\( g(x) = 2x^2 - x \)

\( f(x) = 2x^2 + 7 \)

\( h(x) = \frac{12}{|x|} \)

a) \( f(-4) = 39 \)

\( = 2(-4)^2 + 7 \)

\( = 32 + 7 \)

\( = 39 \)

b) \( g(3) = 15 \)

\( = 2(3)^2 - 3 \)

\( = 18 - 3 \)

\( = 15 \)

c) \( h(-3) = 4 \)

\( = \frac{12}{|-3|} \)

\( = \frac{12}{3} \)

\( = 4 \)
9. Describe the end behavior of the following functions.

a) \[ x \to -\infty, \quad f(x) \to \infty \]

b) \[ x \to -\infty, \quad f(x) \to \infty \]

as \( x \to -\infty, f(x) \to \infty \)
as \( x \to \infty, f(x) \to -\infty \)

10. Graph \[ f(x) = \begin{cases} x^2 - 2x - 3; & x < 1 \\ \frac{2}{3}x - 2; & x \geq 1 \end{cases} \]

on the set of axes provided. Then answer each question.

\[ f(x) = x^2 - 2x - 3 \]

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

Range: \((-4, \infty)\)

Is this graph continuous? YES or NO

Questions 11 & 12 Given the graphs shown below answer questions 11 & 12.

11. Which of the above is the graph of \( y = \frac{3}{2}|x - 2| - 3 \)?

Graph D

12. Determine which graph(s) have an \( a \)-value of \( \frac{3}{2} \). You may choose more than one.

Graphs B + D
13. Graph and then state the domain and range for the function below \( f(x) = |x-4| - 2 \).

Domain: \((\infty, \infty)\)

Range: \([2, \infty)\)

What is the vertex? \((4, -2)\)

What are the zero(s)? \(x = 2\), \(x = 6\)

14. a) Graph the inequality on the set of axes. Then determine if each of the following points are a solution.

\[ y < -2|x-2| + 3 \]

<table>
<thead>
<tr>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2,3)</td>
</tr>
<tr>
<td>(-2,0)</td>
</tr>
<tr>
<td>(1,-4)</td>
</tr>
<tr>
<td>(3,2)</td>
</tr>
</tbody>
</table>

b) Which of the point(s) in part (a) would be a solution if the inequality symbol changed from the < to a \( \leq \)?

Point (2,3) It would be on the \( V \) shape.

15. Solve each of the following absolute value equations or inequality.

a) \( \frac{1}{2} |x-6| = 8 \)

\( \frac{1}{2} x - 6 = 8 \)
\( 2 \cdot \frac{1}{2} x = 14 - 2 \)
\( x = 28 \)

b) \( \frac{2}{3} |x-4| = 12 \)

\( |x-4| = 18 \)

\( x-4 = 18 \)
\( x = 22 \)

\( x-4 = -18 \)
\( x = -14 \)

c) \( -2|3-5x| < 18 \)

\( 3-5x > -9 \)

Pos or 0 > Neg

All Real Solutions

d) \( |x+2| - 8 \geq 6 \)

\( |x+2| \geq 14 \)

\( x+2 \geq 14 \)
\( x \geq 12 \)

\( x+2 \leq -14 \)
\( x \leq -16 \)
16. Describe each of the transformations compared to the parent function for each of the following functions.

a) \( f(x) = -\frac{3}{5}|x-7|+2 \)  
   \( x \) axis reflection  
   7 right  
   2 up  

b) \( f(x) = 3(x+4)^2 + 6 \)  
   stretch of 3  
   4 left  
   6 up

17. What is the vertex of the following function: \( y = 3(x-7)^2 - 5 \)?  
   \( \text{Vertex: } (-2, 6) \)

18. Write the equation of the following function in all three forms:
   Intercept Form: \( y = -2(x+5)(x+1) \)
   Standard Form: \( y = -2(x+3)^2 + 8 \)
   Vertex Form: \( y = -2x^2 - 12x - 10 \)  
   Reversed

19. Determine each of the following given the function \( y = 3x^2 + 10x - 5 \).
   a) What is the axis of symmetry?
      \( x = \frac{-10}{2(3)} = \frac{-10}{6} = -\frac{5}{3} \)
      \( x = -\frac{5}{3} \)
   b) What is the discriminant and state the type and number of solutions?
      \( b^2 - 4ac \)
      \( 100 - 4(3)(-5) \)
      \( \frac{100 + 60}{100 + 60} = 160 \)  
      \( 2 \) real sol

20. Graph the function \( f(x) = -(x+4)(x-2) \) and then determine each of the following.
   \( \text{Vertex: } (-1, 9) \)  
   \( y = -(3)(-3) \)  
   \( y = 9 \)
   \( \text{Axis of Symmetry: } x = -1 \)
   \( \text{Zero(s): } x = -4 \quad x = 2 \)
   \( y\)-intercept: \( (0, 8) \)
   \( \text{Domain: } (-\infty, \infty) \)
   \( \text{Range: } (-\infty, 9] \)
21. Find all values of b that make each trinomial factorable.

\[
\begin{align*}
\text{a) } x^2 + bx - 42 & \quad \pm 14 \quad \pm 3 \quad \pm 1 \quad \pm 7 \\
1, 42 & \quad 4, 21 & \quad 3, 14 & \quad 6, 7
\end{align*}
\]

\[
\begin{align*}
\text{b) } x^2 + bx + 24 & \quad \pm 24 \quad \pm 12 \quad \pm 8 \quad \pm 6 \\
1, 24 & \quad 2, 12 & \quad 3, 8 & \quad 4, 6
\end{align*}
\]

22. Find the equation of the quadratic function, in standard form that has a vertex of (3, -1) and a y-intercept of (0, -4).

\[
y = a(x - 3)^2 - 1
\]

\[
-4 = a(0 - 3)^2 - 1
\]

\[
-3 = 9a
\]

\[
\frac{-1}{3} = a
\]

\[
y = -\frac{1}{3}x^2 + 2x - 4
\]

23. Write the equation of a quadratic function, in intercept form, with zeros 4 and -2, and a y-intercept of -4.

\[
y = a(x - 4)(x + 2)
\]

\[
-4 = a(0 - 4)(0 + 2)
\]

\[
-4 = -8a
\]

\[
\frac{1}{2} = a
\]

\[
y = \frac{1}{2}(x - 4)(x + 2)
\]

24. What would you add to both sides of the equation \(x^2 - 8x = 10\) to complete the square?

\[
\frac{-8}{2} = -4
\]

\[
(-4)^2 = 16
\]

25. Solve the quadratic equation \(x^2 + 10x = -29\) by completing the square.

\[
\frac{16}{2} = 5
\]

\[
x^2 + 10x + 25 = -29 + 25
\]

\[
\sqrt{(x + 5)^2} = \pm \sqrt{-4}
\]

\[
x + 5 = \pm 2i
\]

\[
x = -5 \pm 2i
\]
26. Solve each of the following either by factoring, square root method, Quadratic Formula, or completing the square. Leave all answers in exact form. Check your solutions using Desmos.

a) \((x+3)^2 = 81\)
   \[
   \sqrt{(x+3)^2} = \pm \sqrt{81} \\
   x + 3 = \pm 9 \\
   x + 3 = 9 \quad x + 3 = -9 \\
   x = 6 \quad x = -12
   \]

b) \(4x^2 - 9 = 0\)
   \[
   (2x+3)(2x-3) = 0 \\
   2x = -3 \quad 2x = 3 \\
   x = -\frac{3}{2} \quad x = \frac{3}{2}
   \]

c) \(\frac{2}{3}(x-2)^2 = 30\)
   \[
   \sqrt{(x-2)^2} = \pm \sqrt{45} \\
   x-2 = \pm 3\sqrt{5} \\
   x = 2 \pm 3\sqrt{5}
   \]

d) \(14x^2 = 3x + 2\)
   \[
   14x^2 - 3x - 2 = 0 \\
   (7x+2)(2x-1) = 0 \\
   7x = -2 \quad 2x = 1 \\
   x = -\frac{2}{7} \quad x = \frac{1}{2}
   \]

e) \(3x^2 + 10x = -8\)
   \[
   3x^2 + 10x + 8 = 0 \\
   x^2 + 10x + 8 = 0 \\
   (x + 6)(x + 2) = 0 \\
   \frac{x + 6}{3} \quad x = -\frac{4}{3} \\
   x = -2
   \]

g) \(4x^2 + 3x - 10 = 0\)
   \[
   (4x - 5)(x + 2) = 0 \\
   4x = 5 \quad x = -2 \\
   x = \frac{5}{4}
   \]

f) \(x^2 + 6x + 17 = 0\)
   \[
   x = -6 \pm \sqrt{36 - 4(1)(17)} \\
   x = -6 \pm \sqrt{36 - 68} \\
   x = -6 \pm \sqrt{-32} \\
   x = -6 \pm 4i\sqrt{2} \\
   x = -3 \pm 2i\sqrt{2}
   \]
27. A diver jumps off a platform 25 feet up from the water level with an initial velocity of 20 feet per second. Answer the following and round all answers to two decimal places.

a) Write an equation \( h(t) \) for the diver’s jump.
\[
h(t) = -16t^2 + 20t + 25
\]

b) What is the maximum height the diver reaches?
31.25 ft

c) When does the diver reach her maximum height?
\( t = 0.625 \) second

d) At what time(s) will the diver reach 20 ft?
\( t = 1.06 \) seconds

e) When does the diver hit the water?
\( t = 2.02 \) seconds

28. Solve each of the following system of equations by any method of your choice.

a) \[
y = x^2 + 5x + 6 \]
\[
y = -x^2 - 5x + 6
\]
\[
x^2 + 5x + 6 = -x^2 - 5x + 16
\]
\[
2x^2 + 10x = 0
\]
\[
2x(x + 5) = 0
\]
\[
x = 0 \quad x + 5 = 0
\]
\[
x = 0 \quad x = -5
\]
\[
x = 0 \quad y = 0^2 + 5(0) + 6
\]
\[
y = 6 \quad (0, 6)
\]
\[
x = -6 \quad y = (-6)^2 + 5(-6) + 6
\]
\[
y = 36 - 30 + 6
\]
\[
y = 6 \quad (-5, 6)
\]

b) \[
y = 2x^2 - 7x - 6
\]
\[
-1(y = -2x - 3)
\]
\[
y = 2x^2 - 7x - 6
\]
\[
y = 2x + 3
\]
\[
0 = 2x^2 + 5x - 3
\]
\[
0 = x^2 + 5x - 6
\]
\[
0 = (x + 6)(x - 1)
\]
\[
x = -6 \quad x = 1
\]
\[
y = -2(3) - 3 = -9
\]
\[
(3, -9)
\]
\[
y = -2(-1) - 3
\]
\[
y = 1 - 3
\]
\[
y = -2
\]