1. Consider the following graph:
   a. On what intervals (if any) is the graph increasing? \((-\infty, 0]\)
      decreasing? \([0, \infty)\)
      constant? \(none\)
   b. Is \(y\) a function of \(x\)? Explain your reasoning. 
      \(yes, it\ passes\ VLT\)
   c. What is the domain? \((-\infty, \infty)\)
   d. What is the range? \((-\infty, -3]\)
   e. What is the equation of this graph? 
      \[y = -|x| - 3\]

2. Find the slope and \(y\)-intercept of \(4x + 3y = 6\). Then graph the equation.
   \[4x + 3y = 6\]
   \[3y = -4x + 6\]
   \[y = -4/3x + 2\]
   \[slope = -4/3, y-int = 2\]

3. Find the equation of the line passing through the points \((4, 3)\) and \((-4, -4)\). Put your answer in slope-intercept form.
   \[m = \frac{3 - (-4)}{4 - (-4)} = \frac{7}{8}\]
   \[y - 3 = \frac{7}{8}(x - 4)\]
   \[y - 3 = \frac{7}{8}x - \frac{7}{2}\]
   \[m + \frac{3}{+\frac{3}{+\frac{7}{2}} + \frac{1}{2}}\]
   \[y = \frac{7}{8}x - \frac{7}{2}\]

4. Consider the following equation: \(-9x + 7y = 1\)
   a. Find the slope of a line parallel to the equation above.
      \[\frac{9}{7}\]
   b. Find the slope of a line perpendicular to the equation above.
      \[-\frac{7}{9}\]

5. Find the equation of the line parallel to \(x = 4\) and passing through \((1,3)\).
6. Let \( f(x) = \lceil 2x \rceil \).
   a. Find \( f(2.7) = \lceil 2(2.7) \rceil = \lceil 5.4 \rceil = 5 \)
   b. Find \( f(-3.59) = \lceil 2(-3.59) \rceil = \lceil -7.18 \rceil = -8 \)
   c. Sketch the graph of \( f(x) \).

7. Let \( f(x) = \begin{cases} 
3x + 1 & \text{if } x < -3 \\
-1 & \text{if } x \geq -3 
\end{cases} \)
   a. Find \( f(-5) = 3(-5) + 1 = -14 \)
   b. Find \( f(-3) = -1 \)
   c. Find \( f(3) = -1 \)
   d. Graph \( f(x) \).

8. Sketch the graph of \( f(x) = \sqrt{-x} + 2 \)

9. Sketch the graph of \( f(x) = -|x - 2| \)

10. Describe the sequence of transformations from \( f(x) = \sqrt{x} \) to \( y = -\sqrt{x} + 2 \).
    reflect across x-axis
    shift up 2 units

11. Consider the graph of \( f(x) = x^3 \). Write an equation for the transformation: the graph of \( f(x) \) is reflected across the y-axis, and shifted three units upward.
    \( f(-x) + 3 \)
    \[ g(x) = (-x)^3 + 3 \]
    \[ g(x) = -x^3 + 3 \]
12. Write the equation of the function $f(x) = x^2 + x - 1$ shifted right 2 and down 1.

$$f(x - 2) - 1$$

\[ g(x) = (x - 1)^2 + (x - 1)^2 - 1 - 1 = x^2 - 4x + 4 + x - 2 - 2 \]

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

13. Use the graph of $f$ (see figure) to sketch the graphs of $g$ and $h$. Sketch them on the same axes as $f$ and be sure to label your answers.

a. $g(x) = f(x - 2) + 1$

shift right 2
and up 1

b. $h(x) = -f(x) - 1$

reflect about x-axis
shift down 1

14. Determine whether the following are symmetric with respect to the x-axis, y-axis, origin, or none of these.

a. $y = 2x^4 - 3$

\[ x\text{-axis:} \]
\[ -y = 2x^4 - 3 \]
\[ \text{no} \]

\[ y\text{-axis:} \]
\[ y = 2(-x)^4 - 3 \]
\[ y = 2x^4 - 3 \]
\[ \text{yes} \]

\[ \text{origin:} \]
\[ -y = 2(-x)^4 - 3 \]
\[ -y = 2x^4 - 3 \]
\[ \text{no} \]

b. $y^2 - x^2 = -6$

\[ x\text{-axis:} \]
\[ (-y)^2 - x^2 = -6 \]
\[ y^2 - x^2 = -6 \]
\[ \text{yes} \]

\[ y\text{-axis:} \]
\[ y^2 - (-x)^2 = -6 \]
\[ y^2 - x^2 = -6 \]
\[ \text{yes} \]

\[ \text{origin:} \]
\[ (-y)^2 - (-x)^2 = -6 \]
\[ y^2 - x^2 = -6 \]
\[ \text{yes} \]

15. Determine whether the following are even, odd, or neither.

a. $f(x) = x^5 - 2x^3$

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

\[ \text{odd} \]

b. $f(x) = x^3 - x + 9$

\[ f(-x) = (-x)^3 - (-x) + 9 \]
\[ = -x^3 + x + 9 \]

\[ \text{neither} \]
16. Give the vertex, axis of symmetry, domain, range, and graph of the quadratic \( f(x) = (x - 5)^2 - 4 \). Determine the intervals on which the function is increasing and interval on which the function is decreasing.

\[
\text{Vertex: } (5, -4) \\
\text{Axis: } x = 5 \\
\text{Domain: } (-\infty, \infty) \\
\text{Range: } [-4, \infty) \\
\text{Increasing: } [5, \infty) \\
\text{Decreasing: } (-\infty, 5]
\]

17. Give the vertex, axis of symmetry, domain, range, and graph of the quadratic \( f(x) = 2x^2 - 4x + 5 \). Determine the intervals on which the function is increasing and interval on which the function is decreasing.

\[
x = \frac{-b}{2a} = \frac{-(-4)}{2(2)} = \frac{4}{4} = 1 \\
\text{f(1)} = 2(1)^2 - 4(1) + 5 = 2 - 4 + 5 = 3 \\
\text{f(0)} = 2(0)^2 - 4(0) + 5 = 5
\]

18. Do the following tables describe a functions? State why or why not?

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>-1</td>
<td>3</td>
<td>-1</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.3</td>
<td>7</td>
<td>4.4</td>
<td>6</td>
</tr>
<tr>
<td>3.3</td>
<td>5</td>
<td>3.3</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

Yes, every domain maps to exactly one range.

No, domain 4 maps to two different ranges.

19. Consider the function \( f(x) = \sqrt{x + 1} \).

a. Find \( f(0) \).

\[
f(0) = \sqrt{0 + 1} = \sqrt{1} = 1
\]

b. Find \( f(t - 2) \).

\[
f(t - 2) = \sqrt{t^2 - 4 + 1} = \sqrt{t^2 - 1}
\]

c. Find the domain of \( f(x) \).

\[
\begin{align*}
x + 1 & \geq 0 \\
x & \geq -1 \\
D & = [-1, \infty)
\end{align*}
\]
20. Consider the function \[ f(x) = \frac{\sqrt{x+2}}{x-7}. \]
   a. Find \( f(0) \).
   \[
   f(0) = \frac{\sqrt{0+2}}{0-7} = \frac{\sqrt{2}}{-7} = -\frac{\sqrt{2}}{7}
   \]
   b. Find \( f(t-2) \).
   \[
   f(t-2) = \frac{\sqrt{t-2+2}}{t-2-7} = \frac{\sqrt{t}}{t-9}
   \]
   c. Find the domain of \( f(x) \).
   \[
   x - 7 \neq 0 \\
   x + 2 \geq 0 \\
   x \neq 7 \\
   D: [-2, 7) \cup (7, \infty)
   \]

21. Find the domain of.
   \[ h(x) = \frac{10x-5}{x^2-2x} \]
   \[
   x^2 - 2x = 0 \\
   x(x-2) = 0 \\
   x = 0 \text{ or } x = 2
   \]
   \[
   D: (-\infty, 0) \cup (0, 2) \cup (2, \infty)
   \]

22. A function is used it calculate the number of mopeds, \( m \), built in a factory that employs \( h \) hours of employee work. If the formula is \( m = 60h + 3h^2 - 0.02h^3 \), what is the domain of the function?
   \[
   D: [0, \infty) \quad \text{You can't work a negative amount of hours.}
   \]

23. Let \( f(x) = 2x - 3 \) and \( g(x) = 1 - x \). Find the following and simplify:
   a. \((f-g)(x) = f(x) - g(x) = 2x - 3 - (1-x) = 3x - 4\)
   b. \((fg)(x) = f(x)g(x) = (2x-3)(1-x) = 2x - 2x^2 - 3 + 3x = -2x^2 + 5x - 3\)
   c. \((\frac{f}{g})(-2) = \frac{f(-2)}{g(-2)} = \frac{2(-2)-3}{1-(-2)} = \frac{-4-3}{3} = \frac{-7}{3} = -\frac{7}{3}\)

24. Let \( f(x) = \frac{3}{x^2} \) and \( g(x) = x + 1 \). Find the following and simplify:
   a. \((f \circ g)(x) = f(g(x)) = f(x+1) = \frac{3}{(x+1)^2} \text{ or } \frac{3}{x^2 + 2x + 1}\)
   b. \((g \circ f)(3) = g(f(3)) = g\left(\frac{3}{3^2}\right) = g\left(\frac{3}{9}\right) = g\left(\frac{1}{3}\right) = \frac{\frac{1}{3} + 1}{3} = \frac{4}{9}\)
25. Brigette Cole has a taco stand. Her daily costs are approximated by \( C(x) = x^2 - 40x + 610 \), where \( C(x) \) is the cost, in dollars, to sell \( x \) units of tacos. Find the number of units of tacos she should sell to minimize her costs. What is the minimum cost?

\[
x = \frac{-b}{2a} = \frac{-(-40)}{2(1)} = \frac{40}{2} = 20 \text{ tacos}
\]

\[
C(20) = 20^2 - 40(20) + 610 = 400 - 800 + 610 = $210
\]

26. Use synthetic division to divide \( 6x^3 + 10x^2 + x + 8 \) by \( x - 2 \)

\[
\begin{array}{c|cccc}
2 & 6 & 10 & 1 & 8 \\
 & 12 & 44 & 90 \\
\hline
 & 6 & 22 & 45 & 98 \\
\end{array}
\]

\[6x^2 + 22x + 45 + \frac{98}{x-2}\]

27. Use synthetic division to divide \( -11x^4 + 2x^3 - 8x^2 - 4 \) by \( x + 1 \)

\[
\begin{array}{c|ccccc}
-1 & -11 & 2 & -8 & 0 & -4 \\
 & 11 & -13 & 21 & -21 \\
\hline
 & -11 & 13 & -31 & 21 & -25 \\
\end{array}
\]

\[-11x^3 + 13x^2 - 21x + 21 + \frac{-25}{x+1}\]

28. Express \( f(x) \) in the form \( f(x) = (x - k)q(x) + r \) for the given value of \( k \)

\( f(x) = 2x^3 + x^2 + x - 8; k = -1 \)

\[
\begin{array}{c|ccccc}
-1 & 2 & 1 & 1 & -8 \\
 & -2 & 1 & -2 \\
\hline
 & 2 & -1 & 2 & -10 \\
\end{array}
\]

\[f(x) = (x+1)(2x^2 - x + 2) - 10\]