Always label axes of graphs with numbers and letters.

1. For the function $f(x) = x^2 - 7x + 5$ evaluate and simplify
   a. $f(4)$
   b. $f(x+h)$
   c. $\frac{f(x+h) - f(x)}{h}$

2. Find the domain and range for the function $f(x) = 3 - \sqrt{x+4}$.

3. Is this graph the graph of a function? Why or why not?
4. Given this graph of a piecewise defined function, \( g \), do the following.

   a. find \( g(0) \)
   b. find \( g(2) \)
   c. find the domain and range.
   d. give intervals where the function is increasing and where it is decreasing.

5. For this piecewise defined function

   \[
   g(x) = \begin{cases} 
   3 - x & x < 2 \\
   4 & x = 2 \\
   x^2 - 6 & x > 2 
   \end{cases}
   \]

   a. Sketch the graph;
   b. give the domain and range;
   c. give intervals where the function is increasing and decreasing.
   d. find \( g(1) \), \( g(2) \) and \( g(3) \).
5. You wish to have a cup of tea. You get water from the cold water tap, heat it in the microwave until it boils, put a tea bag in it, let it steep for a couple of minutes, let it cool a couple of minutes more, then drink it. Sketch a graph of the temperature $T$ of the liquid as a function of time $t$. Label the axes with some appropriate numbers and letters.

6. Consider this table of values of pressure and volume of an enclosed gas at a fixed temperature.

<table>
<thead>
<tr>
<th>Pressure</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
<th>150</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>120</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

a. Sketch a graph of volume $V$ as a function of pressure $P$.

b. From the graph, estimate the values of $V(50)$ and $V(20)$.

7. The velocity of a certain falling object is given by $v = 96 - 32 t$ and its position is given by $s = 200 + 96 t - 16 t^2$. Find a formula for the position $s$ as a function of the velocity $v$. 
8. In electricity the force $F$ exerted by two charged particles on each other is directly proportional to the product of the two charges, $q_1$ and $q_2$, and varies inversely as the square of the distance $d$ between the particles.

a. Find a formula for $F$ in terms of $q_1$, $q_2$, and $d$ and a proportionality constant $k$.

b. For two certain particles, $q_1 = 0.4$, $q_2 = 0.3$ and $d = 6$ and the force was 5. Find the proportionality constant $k$ and rewrite the formula for $F$.

c. What is the force if the distance is tripled.

9. Determine whether $f(x) = 3x^3 - 2x^{-1} + 5$ is an even function, odd function or neither, and tell why.
10. Given the graph of $y = f(x)$ below, sketch the graphs of the other functions given in standard form.

- **a.** $-y = f(x-2)$

- **b.** $\frac{y}{3} = f(-x)$

- **c.** $y-4 = f(x/2)$
11. Consider this quadratic function \( y = f(x) = 3x^2 - 12x + 9 \).

a. complete the square to put the equation into standard form;
b. from the standard form, give the shape (factors) and vertex;
c. graph the parabola;
d. give its maximum or minimum point;
e. find its x- and y-intercepts.
12. The price $p$ (in dollars) for a certain type of cosmetic is given by $p = 160 - x$, where $x$ is the number of units (in cases) demanded. The Revenue $R$ (in dollars) is given by $R = p \cdot x$.

a. Find the equation for the Revenue $R$ in terms of $x$.

b. Find the vertex and graph $R$ in terms of $x$.

c. From the graph and its vertex, give the number of units that will produce maximum revenue.

d. Give the maximum revenue.

e. Give the price that will produce maximum revenue.

f. Give the number of units that will produce no revenue.
13. For the functions \( f(x) = \sqrt{x+1} \) and \( g(x) = \frac{x+3}{x-4} \),

(a) Find the product \((f \cdot g)(x)\)

(b) Find the domain of \((f \cdot g)\)

c. Find \( f(g(5)) \)

d. Find the composite function \( f(g(x)) \)

e. Find the composite function \( g(f(x)) \)

f. Sketch a graph of \( y = f(g(x)) \) using a window \(-8 \leq x \leq 8, \ -8 \leq y \leq 8\). Label the axes with numbers.
14. Determine whether the function \( f(x) = x^2 - 8x \) is one-to-one on the interval \([1,5]\). Sketch a graph to support your answer.

15. For the function \( f(x) = \frac{x+2}{x-5} \) find \( f^{-1}(x) \)

16. Show that the \( f \) and \( f^{-1} \) above are inverses of each other by simplifying \( f(f^{-1}(x)) \) and \( f^{-1}(f(x)) \)

17. Decompose this composite function into two functions of which it is the composition.

\[
f'(g(x)) = \frac{(x - 4)^2 + 3}{x - 4}
\]
18. Graph the inverse of the function below.

19. Find the average rate of change for the function \( f(x) = x^2 - 3x + 5 \) between \( x = 1 \) and \( x = 4 \).