Problem. You are walking through a flea market when you notice a table selling crystals. The crystals are broken down into a number of types, each with a cost, as follows:

<table>
<thead>
<tr>
<th>Crystal Type</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colored Crystals</td>
<td>$5</td>
</tr>
<tr>
<td>Clear Crystals</td>
<td>$3</td>
</tr>
<tr>
<td>Patterned Crystals</td>
<td>$3</td>
</tr>
</tbody>
</table>

Consider the relationship that tells you all the possible individual crystals you can buy based on how much money you have. Is this relationship a function? Note: you are considering specific individual crystals, not how many ‘types’ of crystals you can buy.

- No, for one price you can buy many different crystals.
- Yes, for one price you can buy many different crystals.
- Yes, each crystal costs one specific amount.
- No, each crystal costs one specific amount.

Problem. What are the coordinates of a point that is best described as “moved  units horizontally and  units vertically”? (Note: positive is right/up and negative is left/down)

\((?, ?)\)

Problem. Consider the function \(f(x) = -9(6x + 1)^2 - 7\). What is the parent function of \(f(x)\)?

\(f(x) = ?\)

Problem. Consider the functions \(f(x) = 2(x + 6)^3\), \(g(x) = 3\sqrt{x} - 4\) and \(h(x) = x\).

Compute \((f + g)(x) = ?\)

Problem. Consider the function \(f(x) = -4e^{(5x-1)} + 1\). What is the parent function of \(f(x)\)?

\(f(x) = ?\)
Problem. Consider the functions \( f(x) = 7x + 56 \), \( g(x) = 3x + 7 \) and \( h(x) = x^2 \).

Compute \((f + g)(x) = \) ?.

Problem. In a residential neighborhood, most families have multiple cars; at least one for each parent and maybe one for the kids over 16. You have learned to recognize every car in your neighborhood and which house it belongs to. What is the domain of this association (recognizing the car and then recalling which house it belongs to)?

- The houses in the neighborhood.
- Your individual neighbors.
- The cars in the neighborhood.

Problem. You decide to plant pine trees to provide a privacy screen around a piece of your property. Use the following information to answer the questions.

- You choose white pine as it is a fast-growing variety.
- At the time of planting, the trees are all 2 feet tall.
- The land you wish to screen is 14 feet by 20 feet.
- You think pine trees are quite pretty.

Which of these are pieces of data?

- You choose white pine as it is a fast-growing variety.
- At the time of planting, the trees are 2 feet tall.
- The land you wish to screen is 14 feet by 20 feet.
- You think pine trees are quite pretty.

Problem. Does the following graph depict a function?

- Function
- Not a function

Use the following graph for Problems 4-7.
**Problem.** Is The Function That Is Shown Continuous?

<table>
<thead>
<tr>
<th>Continuous</th>
<th>? Check work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not continuous</td>
<td>? Check work</td>
</tr>
</tbody>
</table>

**Problem.** Which Points Mark Local Extrema? (Select All That Apply).

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
</table>

? Check work

**Problem.** Which Points Are Absolute Extrema? Select All That Apply.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
</table>

? Check work

**Problem.** Identify The Zeros Of The Function. (Select All That Apply.)

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
</table>

? Check work

**Problem.** Does The Following Graph Depict A Function?

<table>
<thead>
<tr>
<th>Function</th>
<th>? Check work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not a function</td>
<td>? Check work</td>
</tr>
</tbody>
</table>
Match the graph manipulations to the appropriate parent functions (NOTE: not the actual function of the graph, but the parent function of the graph).

Problem. Use The Plot To Answer The Questions.

What are the coordinates of point a? ( , )
What are the coordinates of point b? ( , )
What are the coordinates of point c? ( , )
What are the coordinates of point d? ( , )

Problem. Which Graph Would Most Properly Be Said To Have A Parent Function \( f(x) = x^2 \)

Plot: ?
Problem. Which Graph Would Most Properly Be Said To Have A Parent Function $\phi(x) = \sqrt{x}$

Plot:

Problem. Which Graph Would Most Properly Be Said To Have A Parent Function $\phi(x) = x$

Plot:

Problem. Which Graph Would Most Properly Be Said To Have A Parent Function $\phi(x) = e^x$

Plot:

Problem. Which Graph Would Most Properly Be Said To Have A Parent Function $\phi(x) = x^3$

Plot:

Problem. Which Graph Would Most Properly Be Said To Have A Parent Function $\phi(x) = \ln(x)$

Plot:

Problem. Which Of The Following Are Examples Of Independent Variables?

- $y =$ height of a wall. You are trying to calculate the surface area of a wall for painting.
- $C =$ total cost of installing new windows. You are modeling the costs for building a house and you know each new window costs $140.
- $n =$ the number of katanas purchased by a martial arts school. You know each katana costs $50 and you are trying to calculate the total cost to equip the
- $P =$ the average price of gasoline from January 1, 2018 to August 1, 2018. You are running analysis on cost to consumers for driving in the first three quar given driving distance habits and gasoline price per gallon for each week.

Check work
Rigid Translation Practice

Problem. Consider the rigid translation of \( f(x) \) described by \( f(x+6)+3 \).

We could describe this translation geometrically by saying that the graph of \( f(x) \) was moved _______ unit(s) to the _______ and _______ unit(s) _______.

Problem. Consider the rigid translation of \( f(x) \) described by \( f(x-6)-5 \).

We could describe this translation geometrically by saying that the graph of \( f(x) \) was moved _______ unit(s) to the _______ and _______ unit(s) _______.

Problem. Consider the rigid translation of \( f(x) \) described by \( f(x-9)+5 \).

We could describe this translation geometrically by saying that the graph of \( f(x) \) was moved _______ unit(s) to the _______ and _______ unit(s) _______.

Transformation Practice

Problem. Consider the transformation of \( f(x) \) described by \( -8f(-\frac{1}{3}x) \).

This transformation could be described geometrically as stretching/compressing the graph horizontally to _______ times its original width and it _______ flipped over the y-axis. It is also stretched/compressed vertically to _______ times its original height and it _______ flipped over the x-axis.
Problem. Consider the transformation of $f(x)$ described by $\frac{3}{2} f \left( \frac{3}{2} x \right)$.

This transformation could be described geometrically as stretching/compressing the graph horizontally to $\frac{3}{2}$ times its original width and it flipped over the $y$-axis. It is also stretched/compressed vertically to ? times its original height and it ? flipped over the $x$-axis.

Problem. Consider the transformation of $f(x)$ described by $\frac{9}{8} f \left( -\frac{1}{4} x \right)$.

This transformation could be described geometrically as stretching/compressing the graph horizontally to ? times its original width and it ? flipped over the $y$-axis. It is also stretched/compressed vertically to ? times its original height and it ? flipped over the $x$-axis.

Combinations of Translations and Transformation Practice

Problem. Consider the function manipulation of $f(x)$ described by:

$$\frac{5}{4} f \left( \frac{8}{3} x - 10 \right) + -8$$

This can be described geometrically as:

First:

- Move 10 units \texttt{right}
- Move 10 units \texttt{left}
- Stretch/Compress horizontally to $\frac{5}{4}$ times its original width and it \texttt{is } not flipped over the $y$ axis.
- Stretch/Compress horizontally to $\frac{8}{3}$ times its original width and it \texttt{is } flipped over the $y$ axis.
- Stretch/Compress horizontally to $\frac{3}{2}$ times its original width and it \texttt{is } not flipped over the $y$ axis.
- Stretch/Compress horizontally to $\frac{8}{9}$ times its original width and it \texttt{is } flipped over the $y$ axis.

`Check work`
Problem. Consider the function manipulation of \( f(x) \) described by:

\[
7f \left( \frac{9}{7} x - 8 \right) + 6
\]

This can be described geometrically as:

First:

- Move 8 units right
- Move 8 units left
- Stretch/compress horizontally to \( \frac{6}{7} \) times its original width and it is not flipped over the y axis.
- Stretch/compress horizontally to \( \frac{6}{7} \) times its original width and it is flipped over the y axis.
- Stretch/compress horizontally to \( \frac{7}{6} \) times its original width and it is not flipped over the y axis.
- Stretch/compress horizontally to \( \frac{7}{6} \) times its original width and it is flipped over the y axis.

Problem. Consider the function manipulation of \( f(x) \) described by:

\[
-4f \left( \frac{8}{7} x - 1 \right) + 7
\]

This can be described geometrically as:

First:

- Move 1 unit right
- Move 1 unit left
- Stretch/compress horizontally to \( \frac{8}{7} \) times its original width and it is not flipped over the y axis.
- Stretch/compress horizontally to \( \frac{8}{7} \) times its original width and it is flipped over the y axis.
- Stretch/compress horizontally to \( \frac{7}{8} \) times its original width and it is not flipped over the y axis.
- Stretch/compress horizontally to \( \frac{7}{8} \) times its original width and it is flipped over the y axis.
Problem. Consider the following functions:

\[ f(x) = 5 \cdot 2^x + 3, \quad g(x) = 4x^2 - 8, \quad h(x) = -10x^3 + 7 \]

Compute the following (Remember, you don’t need to simplify!):

- \((f \circ g)(x) = \) __________
- \((g \circ f)(x) = \) __________
- \(7(f \circ h)(3x) = \) __________
- \(-9f(x) - 8g(x) + h(-7x) = \) __________

Problem. Consider the following functions:

\[ f(x) = -3x^3 - 10, \quad g(x) = -4 \cdot 2^x - 5, \quad h(x) = 2^x - 2 \]

Compute the following (Remember, you don’t need to simplify!):

- \((f \circ g)(x) = \) __________
- \((g \circ f)(x) = \) __________
- \(6(f \circ h)(-6x) = \) __________
- \(5f(x) - 2g(x) + h(-6x) = \) __________
Problem. Consider the following functions:

\[ f(x) = -x + 8, \quad g(x) = -2 \cdot 2^x + 8, \quad h(x) = -5 \sqrt{x} - 5 \]

Compute the following (Remember, you don’t need to simplify!):

- \( (f \circ g)(x) = \) ?
- \( (g \circ f)(x) = \) ?
- \( 6(f \circ h)(-7x) = \) ?
- \( -9f(x) + -6g(x) + h(-7x) = \) ?

Properties of Zero Practice

Problem. You have a function that is defined in terms of three other functions, \( f(x) \), \( g(x) \) and \( h(x) \). Specifically:

\[ F(x) = f(x) \cdot g(x) \cdot h(x) \]

Suppose you know that \( f(2) = 0, \quad g(-6) = 0 \) and \( h(-8) = 0 \).

- What is the sum of the zeros of \( F(x) \)? ?
- What is the product of the zeros of \( F(x) \)? ?
Problem. You Have A Function That Is Defined In Terms Of Three Other Functions; , 
, and . Specifically:

\[ F(x) = f(x) \cdot g(x) \cdot h(x) \]

Suppose you know that \( f(6) = 0 \), \( g(8) = 0 \) and \( h(-2) = 0 \).

- What is the sum of the zeros of \( F(x) \)?
- What is the product of the zeros of \( F(x) \)?

Problem. You Have A Function That Is Defined In Terms Of Three Other Functions; , 
, and . Specifically:

\[ F(x) = f(x) \cdot g(x) \cdot h(x) \]

Suppose you know that \( f(10) = 0 \), \( g(2) = 0 \) and \( h(2) = 0 \).

- What is the sum of the zeros of \( F(x) \)?
- What is the product of the zeros of \( F(x) \)?