Objective: able to shift a graph horizontally/vertically, compress/stretch, and reflect about either axis

1. Graph \( f(x) = x^2 \) and \( g(x) = x^2 + 4 \) on the same axis. What do you notice?

\[
\text{________________________Shift}
\]

If a real number \( k \) is added to the right side of a function \( y = f(x) \), the graph of the new function \( y = f(x) + k \) is the graph of \( f \) shifted \( __________________ \) if \( k > 0 \) or shifted \( __________________ \) if \( k < 0 \).

2. Graph \( f(x) = x^2 \) and \( g(x) = (x - 3)^2 \) on the same axis. What do you notice?

\[
\text{________________________Shift}
\]

If the argument \( x \) of a function \( y = f(x) \) is replaced by \( x-h \), where \( h \) is a real number, the graph of the new function \( y = f(x-h) \) is the graph of \( f \) shifted \( __________________ \) if \( h > 0 \) or shifted \( __________________ \) if \( h < 0 \).

3. If \( f(x) = x^3 \), then what happens to the graph of \( f \) when we have \( g(x) = (x - 2)^3 + 1 \)?
4. Graph \( f(x) = |x| \) and \( g(x) = 0.5|x| \) on the same axis. What do you notice?

When the right side of a function \( y = f(x) \) is multiplied by a positive number \( a \), the graph of the new function \( y = af(x) \) is obtained by multiplying each \( y \)-coordinate on the graph of \( y = f(x) \) by \( a \). The new graph is ______________________ if \( 0 < a < 1 \) or ______________________ if \( a > 1 \).

5. Graph \( f(x) = |x| \) and \( f(4x) = |x| \) on the same axis. What do you notice?

When the argument \( x \) of a function \( y = f(x) \) is multiplied by a positive number \( a \), the graph of the new function \( y = f(ax) \) is obtained by multiplying each \( x \)-coordinate on the graph of \( y = f(x) \) by \( \frac{1}{a} \). The new graph is ______________________ if \( 0 < a < 1 \) or ______________________ if \( a > 1 \).
6 Graph \( f(x) = \sqrt{x} \) and \( g(x) = -\sqrt{x} \) on the same axis. What do you notice?

_______________________about______________________

When the right side of a function \( y = f(x) \) is multiplied by -1, the graph of the new function \( y = -f(x) \) is the______________________________ about ______________________________ of the graph of \( y = f(x) \).

7 Graph \( f(x) = \sqrt{x} \) and \( f(-x) = \sqrt{x} \) on the same axis. What do you notice?

_______________________about______________________

When the graph of a function \( y = f(x) \) is known, the graph of the new function \( y = f(-x) \) is the______________________________ about ______________________________ of the graph of \( y = f(x) \).
8. Find the function that is finally graphed after the following transformations are applied to \( f(x) = |x| \).
   a. Reflect about x-axis
   b. Reflect about y-axis
   c. Shift up 2 units

9. Suppose that the x-intercepts of the graph of \( y = f(x) \) are -8 and 1.
   a. What are the x-intercepts of the graph of \( y = f(x + 4) \)?
   b. What are the x-intercepts of the graph of \( y = f(x - 3) \)?
   c. What are the x-intercepts of the graph of \( y = 2f(x) \)?
   d. What are the x-intercepts of the graph of \( y = f(-x) \)?