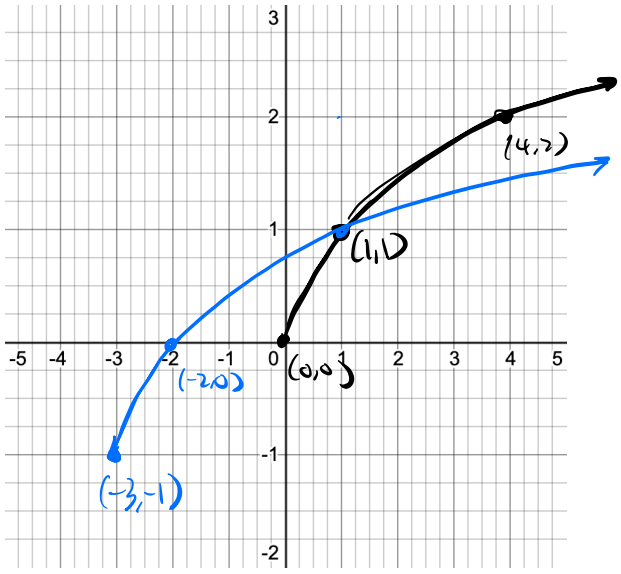
§1.3: Transforming and Combining Functions

1.] Suppose $g(x) = \sqrt{x+3} - 1$. Identify the "parent" function, $f(x)$, that has been transformed, then describe the transformations. Sketch the parent function, $f(x)$, and the transformed function, $g(x)$, on the grid below.

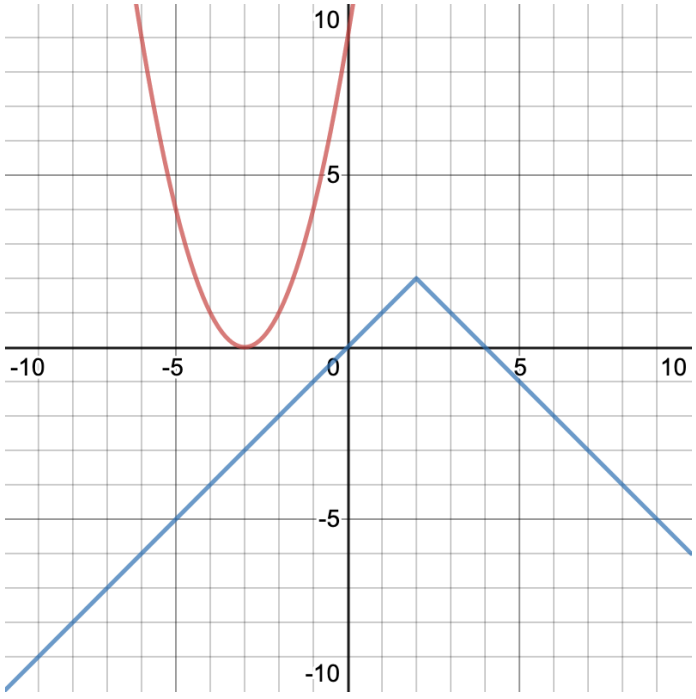


Parent: $f(x) = \sqrt{x}$

New: $g(x) = \sqrt{x+3} - 1$

The graph of $g(x)$ has the same shape of $f(x)$ but shifted 3 units to the left and 1 unit down.

2.] For each of the graphs sketched below, find a possible formula for the function.



Parent: $f(x) = x^2$

New: $g(x) = (x+3)^2$

Parent: $f(x) = |x|$

New: $g(x) = -|x-2| + 2$

3.] Let $f(x) = 3x$ and $g(x) = x^3 - 8$. Find an expression for $(f+g)(x)$ and $(f/g)(x)$, and determine the domain of each function.

$(f+g)(x) = 3x + x^3 - 8 = x^3 + 3x - 8$ ← Polynomial Domain: $\mathbb{R}$, $(-\infty, \infty)$

$(f/g)(x) = \frac{3x}{x^3 - 8}$ ← Rational Domain: $x \neq 2$, $(-\infty, 2) \cup (2, \infty)$

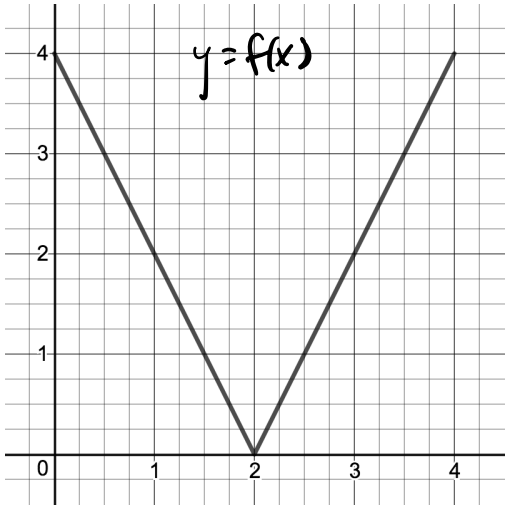
4.] Let $f(x) = x^2$ and $g(x) = x^3 + 1$. Find an expression for $(f \circ g)(x)$ and $(g \circ f)(x)$. Are they the same function?

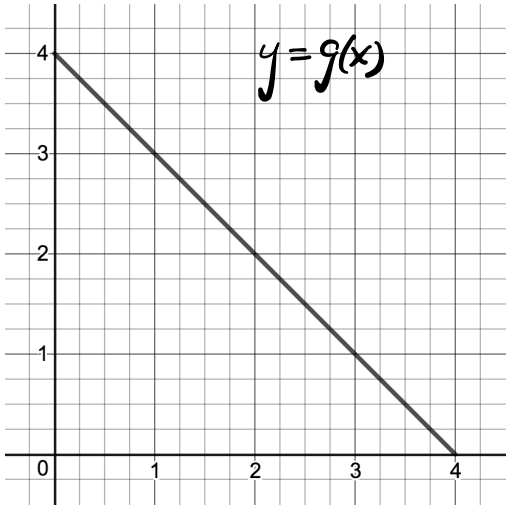
$(f \circ g)(x) = f(g(x)) = f(x^3+1) = (x^3+1)^2 = (x^3+1)(x^3+1) = x^6 + x^3 + x^3 + 1 = x^6 + 2x^3 + 1$

$(g \circ f)(x) = g(f(x)) = g(x^2) = (x^2)^3 + 1 = x^6 + 1$

Not the same.

5.] Use the graph of $f(x)$ (on the left) and the graph of $g(x)$ (on the right) to evaluate the following function values, if they exist:





a.) $(f-g)(1) =$ $f(1) - g(1) = 2 - 3 = -1$

b.) $(f+g)(3) =$ $f(3) + g(3) = 2 + 1 = 3$

c.) $(fg)(4) =$ $f(4) \cdot g(4) = 4 \cdot 0 = 0$

d.) $(f/g)(1) =$ $f(1)/g(1) = 2/3$

e.) $(g/f)(2) =$ $g(2)/f(2) = 2/0 \rightarrow$ DNE

f.) $(f \circ g)(2) =$ $f(g(2)) = f(2) = 0$

g.) $(g \circ f)(2) =$ $g(f(2)) = g(0) = 4$