7.1 Compositions and Inverse Functions pg. 97 Q: 2,3,4

2. $(f \circ g)(x) = (-5x^2) + 3 = -5x^2 + 3$

$(g \circ f)(x) = -5(x + 3)^2$

The domain for both $(f \circ g)(x)$ and $(g \circ f)(x)$: $\{x \mid -\infty \le x \le \infty\}$.

The range for $(f \circ g)(x)$ is $\{y \mid -\infty \le y \le 3\}$, and the range for $(g \circ f)(x)$ is $\{y \mid -\infty \le y \le 0\}$.

3. $f(x) = x - 7$

$y = x - 7$

$y + 7 = x$

$x + 7 = y$

$f^{-1}(x) = x + 7$

$(f \circ f^{-1})(x) = (x + 7) - 7 = x$

$(f^{-1} \circ f)(x) = (x - 7) + 7 = x$

4. $f(x) = \frac{2}{3}x$

$y = \frac{2}{3}x$

$\frac{3}{2}y = x$

$\frac{3}{2}x = y$

$f^{-1}(x) = \frac{3}{2}x$

$(f \circ f^{-1})(x) = \frac{2}{3}\left(\frac{3}{2}x\right) = x$

$(f^{-1} \circ f)(x) = \frac{3}{2}\left(\frac{2}{3}x\right) = x$

7.2 Quadratic and Cubic pg. 101 Q: 2,3,4

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

$\frac{1}{2}(y + 3) = x^2$

$\pm\sqrt{\frac{1}{2}(y + 3)} = \sqrt{x^2}$

$\pm\sqrt{\frac{1}{2}(y + 3)} = x$

$\sqrt{\frac{1}{2}(x + 3)} = y$

$f^{-1}(x) = \sqrt{\frac{1}{2}(x + 3)}$ for $x \ge -3$

Check:

$(f \circ f^{-1})(x)$

$= 2\left(\sqrt{\frac{1}{2}(x + 3)}\right)^2 - 3$, for $x \ge 0$

$= x$

$(f^{-1} \circ f)(x)$

$= \sqrt{\frac{1}{2}\left((2x^2 - 3) + 3\right)}$, for $x \ge 0$

$= x$

3. $y = 5x^3 - 1$

$\frac{1}{5}(y + 1) = x^3$

$\sqrt[3]{\frac{1}{5}(y + 1)} = \sqrt[3]{x^3}$

$\sqrt[3]{\frac{1}{5}(y + 1)} = x$

$\sqrt[3]{\frac{1}{5}(x + 1)} = y$

$f^{-1}(x) = \sqrt[3]{\frac{1}{5}(x + 1)}$

Check:

$(f \circ f^{-1})(x)$

$= 5\left(\sqrt[3]{\frac{1}{5}(x + 1)}\right)^3 - 1$

$= x$

$(f^{-1} \circ f)(x)$

$= \sqrt[3]{\frac{1}{5}\left((5x^3 - 1) + 1\right)}$

$= x$

4. $y = \frac{2}{5}x^3 - 1$

$\frac{5}{2}(y + 1) = x^3$

$\sqrt[3]{\frac{5}{2}(y + 1)} = \sqrt[3]{x^3}$

$\sqrt[3]{\frac{5}{2}(y + 1)} = x$

$\sqrt[3]{\frac{5}{2}(x + 1)} = y$

$f^{-1}(x) = \sqrt[3]{\frac{5}{2}(x + 1)}$

Check:

$(f \circ f^{-1})(x)$

$= \frac{2}{5}\left(\sqrt[3]{\frac{5}{2}(x + 1)}\right)^3 - 1$

$= x$

$(f^{-1} \circ f)(x)$

$= \sqrt[3]{\frac{5}{2}\left(\left(\frac{2}{5}x^3 - 1\right) + 1\right)}$

$= x$

7.3 Graphing Square Root pg. 105 Q: 2,3

2. $g(x) = -\sqrt{x - 3} + 5$

Sketch the graph of $g(x) = -\sqrt{x - 3} + 5$ using transformations of the graph of $g(x) = \sqrt{x}$.

Step 1: Inspect g to make sure it is written in the form $p(x) = a\sqrt{x - h} + k$.

Step 2: Identify the values of a, h, and k: $a = -1, h = 3, k = 5$.

Step 3: Determine the mapping of $(0, 0)$ and $(1, 1)$ on the parent function f to their corresponding points on the graph of g.

$(0, 0)$ is mapped to (h, k): $(0, 0) \rightarrow (3, 5)$.

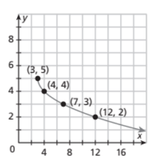
$(1, 1)$ is mapped to $(h + 1, k + a)$: $(1, 1) \rightarrow (4, 4)$.

Step 4: Determine a few other points on the graph of g.

$g(7) = -\sqrt{7 - 3} + 5 = 3$

$g(12) = -\sqrt{12 - 3} + 5 = 2$

Step 5: Sketch the graph of g by plotting the points $(3, 5)$, $(4, 4)$, $(7, 3)$, and $(12, 2)$. Then draw a smooth curve starting from $(3, 5)$ and passing through the other points.



3. Write a square root function for the graph shown.

The endpoint (h, k) is $(2, 5)$, so $h = 2$ and $k = 5$.

To determine the value of a, use the second point $(6, 4)$ shown on the graph.

To determine the value of a, the x-coordinate of the second point needs to be 6. Use the $p(x) = a\sqrt{x - h} + k$ form to replace x, h, k, and $p(x)$ to find the value of a.

$4 = a\sqrt{6 - 2} + 5;$

$4 = a\sqrt{4} + 5;$

$4 = a(2) + 5;\ a = -\frac{1}{2}$

Since $a = -\frac{1}{2}$, $h = 2$, and $k = 5$, the equation that defines the function is $f(x) = -\frac{1}{2}\sqrt{x - 2} + 5$.

Use the coordinates $(11, 3.5)$ and $(18, 3)$ to verify that the equation for the function graph is correct.

$f(11) = -\frac{1}{2}\sqrt{11 - 2} + 5 = 3.5$

$f(18) = -\frac{1}{2}\sqrt{18 - 2} + 5 = 3$

7.4 Graphing Cube Root pg. 109 Q: 2,3

2. Sketch the graph of $j(x) = -2\sqrt[3]{x}$ using transformations of the graph of $f(x) = \sqrt[3]{x}$.

Step 1: Identify the values of a, h, and k: $a = -2, h = 0, k = 0$.

Step 2: Determine the mapping of $(-1, -1)$, $(0, 0)$, and $(1, 1)$ on the graph of the parent function f to their corresponding points on the graph of j.

$(-1, -1)$ is mapped to $(h - 1, k - a)$: $(-1, -1) \rightarrow (0 - 1, 0 + 2) = (-1, 2)$.

$(0, 0)$ is mapped to (h, k): $(0, 0) \rightarrow (0, 0)$.

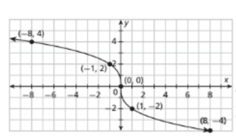
$(1, 1)$ is mapped to $(h + 1, k + a)$: $(1, 1) \rightarrow (0 + 1, 0 - 2) = (1, -2)$.

Step 3: Determine a few other points on the graph of j.

$j(8) = -2\sqrt[3]{8} = -4$

$j(-8) = -2\sqrt[3]{-8} = 4$

Step 4: Sketch the graph of j by plotting the points $(-8, 4)$, $(-1, 2)$, $(0, 0)$, $(1, -2)$, and $(8, -4)$. Then draw a smooth curve through the points.



3. The point of rotational symmetry (h, k) is $(-2, -5)$, so $h = -2$ and $k = -5$. To determine the value of b, examine the horizontal change from $(-2, -5)$ to the point $(b + h, k + 1)$. Use $(0, -4)$ to find b; $b = 2$. Use the $p(x) = \sqrt[3]{\frac{1}{b}(x - h)} + k$ form. Since $b = 2$, $h = -2$, and $k = -5$, the equation that defines the function is $f(x) = \sqrt[3]{\frac{1}{2}(x + 2)} - 5$. Use coordinates $(-4, -6)$ and $(14, -3)$ to verify the equation.