

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Find $f \circ g$ and $g \circ g$ for $f(x) = 3x + 7$, $g(x) = x^2 - 1$, and state the domain of each.

$$f \circ g = 3(x^2 - 1) + 7 = 3x^2 - 3 + 7 = 3x^2 + 4 \quad D: (-\infty, \infty)$$

$$g \circ g = (x^2 - 1)^2 - 1 = x^4 - 2x^2 + 1 - 1 = x^4 - 2x^2 \quad D: (-\infty, \infty)$$

2. Find the inverse function $f^{-1}(x)$ for the function $f(x) = \frac{2x-3}{x+1}$. What is the domain and range of the function and its inverse?

$$x = \frac{2y-3}{y+1} \rightarrow x(y+1) = 2y-3 \rightarrow xy + x = 2y-3 \rightarrow$$

$$xy - 2y = -x - 3 \rightarrow y(x-2) = -x-3 \rightarrow$$

$$y = f^{-1}(x) = \frac{-x-3}{x-2} \quad \begin{array}{l} f(x) \\ D: x \neq -1 \\ R: y \neq 2 \end{array} \quad \begin{array}{l} f^{-1}(x) \\ x \neq 2 \\ y \neq -1 \end{array}$$

3. Find the inverse function of $f(x) = x^3 - 1$. Sketch the graph of f and f^{-1} on the same graph. Plot the line of symmetry.

$$y = x^3 - 1$$

$$x = y^3 - 1$$

$$x + 1 = y^3$$

$$y = \sqrt[3]{x+1}$$

