

Name: Key

1. Given $f(x) = 2x^2 + 4x - 3$ and $g(x) = 5x - 2$, find each function.

Find all of the following pieces:

a. $(f + g)(x)$

$$\begin{aligned} & f(x) + g(x) \\ & (2x^2 + 4x - 3) + (5x - 2) \\ & 2x^2 + 9x - 5 \end{aligned}$$

b. $(f \cdot g)(x)$

$$\begin{aligned} & (2x^2 + 4x - 3)(5x - 2) \\ & \begin{array}{r} 10x^3 - 4x^2 \\ + 20x^2 - 8x \\ - 15x + 6 \\ \hline 10x^3 + 16x^2 - 23x + 6 \end{array} \end{aligned}$$

c. $[f \circ g](x) = f(g(x))$

$$\begin{aligned} & 2(5x - 2)^2 + 4(5x - 2) - 3 \\ & 2(25x^2 - 20x + 4) + 20x - 8 - 3 \\ & 50x^2 - 40x + 8 + 20x - 11 \\ & 50x^2 - 20x - 3 \end{aligned}$$

d. $\left(\frac{f}{g}\right)(x)$

$$\frac{2x^2 + 4x - 3}{5x - 2}$$

$x \neq \frac{2}{5}$

e. $(f - g)(x)$

$$\begin{aligned} & (2x^2 + 4x - 3) - (5x - 2) \\ & 2x^2 + 4x - 3 - 5x + 2 \\ & 2x^2 - x - 1 \end{aligned}$$

f. $[g \circ f](x) = g(2x^2 + 4x - 3)$

$$\begin{aligned} & 5(2x^2 + 4x - 3) - 2 \\ & 10x^2 + 20x - 15 - 2 \\ & 10x^2 + 20x - 17 \end{aligned}$$

2. Determine whether each pair of functions are inverse functions. Write yes or no. SHOW YOUR WORK!

a. $f(x) = 2x + 16$

$g(x) = \frac{1}{2}x - 8$

$$\begin{aligned} (f \circ g)(x) &= f\left(\frac{1}{2}x - 8\right) \\ &= 2\left(\frac{1}{2}x - 8\right) + 16 \\ &= x - 16 + 16 \\ &= x \checkmark \end{aligned}$$

$(g \circ f)(x) = g(2x + 16)$

$$\begin{aligned} &= \frac{1}{2}(2x + 16) - 8 \\ &= x + 8 - 8 \\ &= x \checkmark \end{aligned}$$

Yes

b. $f(x) = x^2 - 5$

$g(x) = 5 + x^{-2}$

$$\begin{aligned} (f \circ g)(x) &= f(5 + x^{-2}) \\ &= (5 + x^{-2})(5 + x^{-2}) - 5 \\ &= 25 + 10x^{-2} + x^{-4} - 5 \neq x \end{aligned}$$

No

3. Find the inverse of each function.

a. $h(x) = \frac{2}{5}x + 8$

$x = \frac{2}{5}y + 8$

$x - 8 = \frac{2}{5}y$

$\frac{5}{2}(x - 8) = y = f^{-1}(x)$

$\frac{5x}{2} - 20 = f^{-1}(x)$