

Let $f(x) = 2x - 1$, $g(x) = 3x$, and $h(x) = 2x^2 - 3x + 1$. Compute the following:

1.) $f(g(-3))$

$$g(-3) = 3(-3) = -9$$

$$f(-9) = 2(-9) - 1 = -18 - 1 = \boxed{-19}$$

2.) $f(h(x))$

$$2(2x^2 - 3x + 1) - 1$$

$$4x^2 - 6x + 2 - 1$$

$$\boxed{4x^2 - 6x + 1}$$

3.) $g(h(3))$

$$h(3) = 2(3)^2 - 3(3) + 1 = 18 - 9 + 1 = 10$$

$$g(10) = 3(10) = \boxed{30}$$

4.) $h(f(x))$

$$2(2x-1)^2 - 3(2x-1) + 1$$

$$2(4x^2 - 2x - 2x - 1) - 6x + 3 + 1$$

$$8x^2 - 8x - 2 - 6x + 4$$

$$\boxed{8x^2 - 14x + 2}$$

5.) $g(f(0))$

$$f(0) = 2(0) - 1 = -1$$

$$g(-1) = 3(-1) = \boxed{-3}$$

6.) $h(g(-4))$

$$g(-4) = 3(-4) = -12$$

$$h(-12) = 2(-12)^2 - 3(-12) + 1 = \boxed{325}$$

7.) $f(g(h(x)))$

$$g(h(x)) = 3(2x^2 - 3x + 1) = 6x^2 - 9x + 3$$

$$f(g(h(x))) = 2(6x^2 - 9x + 3) - 1$$

$$= 12x^2 - 18x + 6 - 1$$

$$\boxed{12x^2 - 18x + 5}$$

8.) $h(g(f(5)))$

$$f(5) = 2(5) - 1 = 9$$

$$g(9) = 3(9) = 27$$

$$h(27) = 2(27)^2 - 3(27) + 1 = \boxed{1378}$$

9.) $g(f(h(-6)))$

$$h(-6) = 2(-6)^2 - 3(-6) + 1 = 91$$

$$f(91) = 2(91) - 1 = 181$$

$$g(181) = 3(181) = \boxed{543}$$

Find the inverse for each function.

10.) $y = \frac{3}{4}x - 2$

$$x = \frac{3}{4}y - 2$$

$$x + 2 = \frac{3}{4}y$$

$$\frac{4}{3}(x + 2) = y$$

$$\frac{4}{3}x + \frac{8}{3} = y$$

$$f^{-1}(x) = \frac{4}{3}x + \frac{8}{3}$$

11.) $f(x) = (x - 2)^2 + 3$

$$x = (y - 2)^2 + 3$$

$$x - 3 = (y - 2)^2$$

$$\sqrt{x - 3} = y - 2$$

$$\sqrt{x - 3} + 2 = y$$

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

12.) $y = \sqrt[3]{2x + 1} - 4$

$$x = \sqrt[3]{2y + 1} - 4$$

$$x + 4 = \sqrt[3]{2y + 1}$$

$$(x + 4)^3 = 2y + 1$$

$$(x + 4)^3 - 1 = 2y$$

$$f^{-1}(x) = \frac{(x + 4)^3 - 1}{2}$$

13.) $g(x) = 4 - 2(x+1)^2$

$$x = 4 - 2(y+1)^2$$

$$x - 4 = -2(y+1)^2$$

$$\frac{x-4}{-2} = (y+1)^2$$

$$\sqrt{\frac{x-4}{-2}} = y+1$$

$$f^{-1}(x) = \sqrt{\frac{x-4}{-2}} - 1$$

14.) $h(x) = -\frac{2}{3}x + 4$

$$x = -\frac{2}{3}y + 4$$

$$x - 4 = -\frac{2}{3}y$$

$$\frac{-3}{2}(x-4) = y$$

$$f^{-1}(x) = \frac{-3}{2}x + 6$$

15.) $f(x) = \sqrt{3x-1} + 2$

$$x = \sqrt{3y-1} + 2$$

$$x - 2 = \sqrt{3y-1}$$

$$(x-2)^2 = 3y-1$$

$$(x-2)^2 + 1 = 3y$$

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

Verify if the following functions are inverses of each other.

16.) $f(x) = 2x - 5$ and $g(x) = \frac{1}{2}x + \frac{5}{2}$

$$2\left(\frac{1}{2}x + \frac{5}{2}\right) - 5$$

$$x + 5 - 5$$

$$\boxed{x}$$

$$\frac{1}{2}(2x - 5) + \frac{5}{2}$$

$$x - \frac{5}{2} + \frac{5}{2}$$

$$\boxed{x}$$

17.) $f(x) = \frac{\sqrt{x-2}}{3}$ and $g(x) = 3x^2 + 2$

$$\sqrt{3x^2 + 2 - 2}$$

$$3$$

$$\sqrt{3x^2}$$

$$3$$

nope

$$3\left(\frac{\sqrt{x-2}}{3}\right)^2 + 2$$

$$3\left(\frac{x-2}{9}\right) + 2$$

$$\frac{x-2}{3} + 2$$

$$3$$

nope