

Perform the indicated operation given the following functions.

$$f(x) = 2x - 5$$

$$g(x) = x^2 + 1$$

$$h(x) = x - 2$$

1.) $f(x) - h(x)$

$$(2x - 5) - (x - 2)$$

$$2x - 5 - x + 2$$

$$\boxed{x - 3}$$

Domain: \mathbb{R}

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

$$(2x - 5) + (x^2 + 1)$$

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

Domain: \mathbb{R}

3.) $h(x) \cdot f(x)$

$$(x - 2)(2x - 5)$$

$$2x^2 - 4x - 5x + 10$$

$$\boxed{2x^2 - 9x + 10}$$

Domain: \mathbb{R}

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

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

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

5.) $g(f(x))$

$$(2x - 5)^2 + 1$$

$$4x^2 - 10x + 25 + 1$$

$$\boxed{4x^2 - 10x + 26}$$

Domain: \mathbb{R}

6.) $f(h(x))$

$$2(x - 2) - 5$$

$$2x - 4 - 5$$

$$\boxed{2x - 9}$$

Domain: \mathbb{R}

Evaluate each problem given the following functions.

$$k(x) = 4x - 1$$

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

$$g(x) = 5x$$

7.) $k(3)$

$$4(3) - 1$$

$$\boxed{11}$$

8.) $h(-2)$

$$(-2)^2 - 3(-2)$$

$$4 + 6$$

$$\boxed{10}$$

9.) $k(g(2))$

$$g(2) = 5(2) = 10$$

$$k(10) = 4(10) - 1$$

$$\boxed{39}$$

10.) $k(h(-2))$

$$h(-2) = 10$$

$$k(10) = \boxed{39}$$

11.) $g(k(-1))$

$$k(-1) = 4(-1) - 1 = -5$$

$$g(-5) = 5(-5) = \boxed{-25}$$

Verify that f and g are inverse functions by composition.

12.) $f(x) = 3x - 4$ and $g(x) = \frac{1}{3}x + \frac{4}{3}$

$$f(g(x)) = 3\left(\frac{1}{3}x + \frac{4}{3}\right) - 4$$

$$= x + 4 - 4$$

$$= \textcircled{x}$$

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

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

$$= \textcircled{x}$$

Yes, they are
inverses

Find the inverse of each function.

13.) $f(x) = 4x + 3$

$$y = 4x + 3$$

$$x = 4y + 3$$

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

$$\boxed{y = \frac{x-3}{4} \text{ or } y = \frac{x}{4} - \frac{3}{4}}$$

14.) $f(x) = 3x^2 + 1$

$$y = 3x^2 + 1$$

$$x = 3y^2 + 1$$

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

$$\sqrt{\frac{x-1}{3}} = \sqrt{y^2} \rightarrow \boxed{y = \sqrt{\frac{x-1}{3}}}$$