Question

7) Given $f(x) = 3x - 2$ and $g(x) = \frac{1}{3}x + \frac{2}{3}$ find the composite $f(g(x))$.

a) x
b) $2x$
c) $-3x$
d) $5x$

Solution

To find $f(g(x))$ we shall substitute function g in for every variable that occurs in function f:

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

$$= x + 2 - 2 = x.$$

Answer: a) x.

Question

8) Given $f(x) = 3x - 2$ find $f^{-1}(x)$

a) $f^{-1}(x) = \frac{x}{3} + \frac{2}{3}$
b) $f^{-1}(x) = \frac{1}{3} + \frac{2x}{3} =$
c) $f^{-1}(x) = \frac{x}{2} + \frac{2}{5}$
d) $f^{-1}(x) = \frac{x}{3} - 13$

Solution

Here's the original function:

$$y = 3x - 2$$

Now we need to solve it for '$x =$':

$$y = 3x - 2$$

$$3x = y + 2$$

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

Once we have an expression for 'x =', we shall switch x and y. The expression for 'y =' is the inverse function $f^{-1}(x)$:

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

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