

FUNCTIONS

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Worked example

If $f(x) = 3x + 4$, evaluate:

$$f(2)$$

$$f(-4)$$

If $g(x) = -2x - 5$, evaluate:

$$g(1)$$

$$g(-3)$$

Your turn

If $h(x) = -3x + 7$, evaluate:

$$h(5)$$

$$-8$$

$$h(-2)$$

$$13$$

Worked example

If $f(x) = 3x + 4$, find x when
 $f(x) = 19$

If $g(x) = -2x - 5$, find x when
 $g(x) = -13$

Your turn

If $h(x) = -3x + 7$, find x when
 $h(x) = 1$

$$x = 2$$

Worked example

If $f(x) = \frac{x}{3} + 2$, evaluate:

$$f(3)$$

$$f(-6)$$

If $g(x) = \frac{x-3}{2}$, evaluate:

$$g(3)$$

$$g(-6)$$

Your turn

If $h(x) = \frac{x}{4} - 5$, evaluate:

$$h(24)$$

1

$$h(4)$$

-4

Worked example

If $f(x) = \frac{x}{3} + 2$, find x when
 $f(x) = 8$

If $g(x) = \frac{x-3}{2}$, find x when
 $g(x) = -4$

Your turn

If $h(x) = \frac{x}{4} - 5$, find x when
 $h(x) = -2$

$$x = 12$$

Worked example

If $f(x) = x^2 + 3$, evaluate:
 $f(4)$ $f(-2)$

If $g(x) = x^3 - 5$, evaluate:
 $g(4)$ $g(-2)$

Your turn

If $h(x) = x^2 + 4$, evaluate:
 $h(5)$
29

$h(-2)$
8

Worked example

If $f(x) = x^2 + 3$, find x when
 $f(x) = 19$

If $g(x) = x^3 - 5$, find x when
 $g(x) = 3$

Your turn

If $h(x) = x^2 + 4$, find x when
 $h(x) = 29$

$$x = \pm 5$$

Worked example

If $f(x) = 2x^2 + 3x$, evaluate:
 $f(4)$ $f(-2)$

If $g(x) = x^3 - 5x$, evaluate:
 $g(4)$ $g(-2)$

Your turn

If $h(x) = 3x^2 - 4x$, evaluate:
 $h(5)$
55

$h(-2)$
20

Worked example

If $f(x) = 2x^2 + 3x$, find x where
 $f(x) = 20$

If $g(x) = x^3 - 5x$, find x where
 $g(x) = 0$

Your turn

If $h(x) = 3x^2 - 4x$, find x where
 $h(x) = 15$

$$x = 3, x = -\frac{5}{3}$$

Worked example

If $f(x) = 3x + 4$, $g(x) = 2x - 5$

$$fg(x) =$$

$$gf(x) =$$

Your turn

If $f(x) = 4x - 3$, $g(x) = 5x + 2$

$$fg(x) = 20x + 5$$

$$gf(x) = 20x - 13$$

Worked example

If $f(x) = 3x + 4$, $g(x) = 2x - 5$

$$fg(6) =$$

$$gf(7) =$$

Your turn

If $f(x) = 4x - 3$, $g(x) = 5x + 2$

$$fg(8) = 165$$

$$gf(8) = 147$$

Worked example

$$\text{If } f(x) = 3x^2, g(x) = x - 4$$

$$fg(x) =$$

$$gf(x) =$$

Your turn

$$\text{If } f(x) = 5x^2, g(x) = x + 3$$

$$fg(x) = 5(x + 3)^2$$

or $5x^2 + 30x + 45$

$$gf(x) = 5x^2 + 3$$

Worked example

If $f(x) = 3x^2$, $g(x) = x - 4$

$$fg(5) =$$

$$gf(6) =$$

Your turn

If $f(x) = 5x^2$, $g(x) = x + 3$

$$fg(7) = \quad 500$$

$$gf(7) = \quad 248$$

Worked example

$$\text{If } f(x) = 5x^3, g(x) = 2x + 3$$

$$fg(x) =$$

$$gf(x) =$$

Your turn

$$\text{If } f(x) = 4x^2, g(x) = 3x + 2$$

$$fg(x) = 4(3x + 2)^2$$

or $36x^2 + 48x + 16$

$$gf(x) = 12x^2 + 2$$

Worked example

If $f(x) = 5x^3$, $g(x) = 2x + 3$

$$fg(2) =$$

$$gf(3) =$$

Your turn

If $f(x) = 4x^2$, $g(x) = 3x + 2$

$$fg(4) = 784$$

$$gf(4) = 194$$

Worked example

$$\text{If } f(x) = x + 3, g(x) = \frac{1}{x-2}$$

$$fg(x) =$$

$$gf(x) =$$

Your turn

$$\text{If } f(x) = x - 5, g(x) = \frac{1}{x+4}$$

$$fg(x) = \frac{1}{x+4} - 5$$

$$gf(x) = \frac{1}{x-1}$$

Worked example

$$\text{If } f(x) = x + 3, g(x) = \frac{1}{x-2}$$

$$fg(5) =$$

$$gf(5) =$$

Your turn

$$\text{If } f(x) = x - 5, g(x) = \frac{1}{x+4}$$

$$fg(8) = -\frac{59}{12}$$

$$gf(8) = \frac{1}{7}$$

Worked example

If $f(x) = x + 3$:

$$ff(x)$$

$$f^2(x)$$

If $g(x) = 5x$:

$$gg(x)$$

$$g^2(x)$$

If $h(x) = 2x - 3$:

$$hh(x)$$

$$h^2(x)$$

Your turn

If $f(x) = 3x - 2$:

$$f^2(x)$$

$$9x - 8$$

Worked example

If $f(x) = \frac{x}{5}$:

$$ff(x)$$

$$f^2(x)$$

If $g(x) = \frac{x+2}{3}$:

$$gg(x)$$

$$g^2(x)$$

If $h(x) = \frac{3x-1}{5}$:

$$hh(x)$$

$$h^2(x)$$

Your turn

If $f(x) = \frac{x-3}{2}$:

$$f^2(x)$$

$$\frac{x-9}{4}$$

Worked example

If $f(x) = x^2$:

$$ff(x)$$

$$f^2(x)$$

If $g(x) = 3x^2$:

$$gg(x)$$

$$g^2(x)$$

If $h(x) = 4x^2 - 3$:

$$hh(x)$$

$$h^2(x)$$

Your turn

If $f(x) = 5x^2 - 2$:

$$f^2(x)$$

$$100x^4 - 100x^2 + 18$$

Worked example

If $f(x) = x^2$, $g(x) = 2x + 3$,
solve $f(x) = g(x)$

If $p(x) = 3x^2$, $q(x) = 7x - 2$,
solve $p(x) = q(x)$

Your turn

If $f(x) = x^2$, $g(x) = 3x - 2$,
solve $f(x) = g(x)$

$$x = 1, x = 2$$

Worked example

Find the inverse function:

$$f(x) = x + 7$$

$$g(x) = 3x - 5$$

Your turn

Find the inverse function:

$$h(x) = 4x + 2$$

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

Worked example

Find the inverse function:

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

$$g(x) = \frac{3x - 2}{5}$$

Your turn

Find the inverse function:

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

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

Worked example

Find the inverse function:

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

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

Your turn

Find the inverse function:

$$h(x) = 5 + \frac{x}{4}$$

$$h^{-1}(x) = 4(x - 5)$$

Worked example

Find the inverse function:

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

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

Your turn

Find the inverse function:

$$h(x) = \frac{x}{5} + 4$$

$$h^{-1}(x) = 5(x - 4)$$

Worked example

Find the inverse function:

$$f(x) = 3(x - 2)$$

$$g(x) = 2(x + 3)$$

Your turn

Find the inverse function:

$$h(x) = 5(x + 4)$$

$$h^{-1}(x) = \frac{x}{5} - 4$$

Worked example

Find the inverse function:

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

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

Your turn

Find the inverse function:

$$h(x) = \frac{5}{x} + 4$$

$$h^{-1}(x) = \frac{5}{x - 4}$$

Worked example

Find the inverse function:

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

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

Your turn

Find the inverse function:

$$h(x) = \frac{5}{x-4}$$

$$h^{-1}(x) = \frac{5}{x} + 4$$

Worked example

Find the inverse function:

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

$$g(x) = \frac{3}{2 - 5x}$$

Your turn

Find the inverse function:

$$h(x) = \frac{4}{5 - 3x}$$

$$h^{-1}(x) = \frac{5x - 4}{3x}$$

Worked example

Find the inverse function:

$$f(x) = 3\sqrt{x}$$

$$g(x) = 5\sqrt[3]{x}$$

Your turn

Find the inverse function:

$$h(x) = 4\sqrt{x}$$

$$h^{-1}(x) = \frac{x^2}{16}$$

Worked example

Find the inverse function:

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

$$g(x) = 5\sqrt[3]{x} + 3$$

Your turn

Find the inverse function:

$$h(x) = 4\sqrt{x} - 5$$

$$h^{-1}(x) = \frac{(x + 5)^2}{16}$$

Worked example

Find the inverse function:

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

$$g(x) = \frac{2x - 3}{x + 2}$$

Your turn

Find the inverse function:

$$h(x) = \frac{4x - 5}{x - 3}$$

$$h^{-1}(x) = \frac{3x - 5}{x - 4}$$

Worked example

Find the inverse function:

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

$$g(x) = \sqrt[3]{\frac{3x-2}{x-4}}$$

Your turn

Find the inverse function:

$$h(x) = \sqrt{\frac{5x-4}{x+3}}$$

$$h^{-1}(x) = \frac{3x^2 + 4}{5 - x^2}$$

Worked example

Find the inverse function:

$$f(x) = x^2 + 4x - 5$$

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

Your turn

Find the inverse function:

$$h(x) = x^2 + 8x - 5$$

$$h^{-1}(x) = -4 + \sqrt{x + 21}$$

Worked example

Find the inverse function:

$$f(x) = 2x^2 - 10x + 9$$

$$g(x) = 3x^2 - 8x + 2$$

Your turn

Find the inverse function:

$$h(x) = 2x^2 - 12x + 3$$

$$h^{-1}(x) = 3 + \sqrt{\frac{x + 15}{2}}$$

Worked example

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

$$f(x + 2) \qquad f(x - 2)$$

$$f(2x) \qquad f\left(\frac{1}{2}x\right)$$

Your turn

$$g(x) = 5x^2 + 3$$

$$\begin{array}{ll} g(x + 4) & f(x - 4) \\ 5(x + 4)^2 + 3 & 5(x - 4)^2 + 3 \\ = 5x^2 + 40x + 83 & = 5x^2 - 40x + 83 \end{array}$$

$$\begin{array}{ll} g(3x) & g\left(\frac{1}{3}x\right) \\ 5(3x)^2 + 3 & 5\left(\frac{1}{3}x\right)^2 + 3 \\ = 45x^2 + 3 & = \frac{5}{9}x^2 + 3 \end{array}$$

Worked example

$$f(x) = 3x^2 - 5x - 2$$

$$f(x + 2) \qquad f(x - 2)$$

$$f(2x) \qquad f\left(\frac{1}{2}x\right)$$

Your turn

$$g(x) = 5x^2 - 2x + 3$$

$$g(x + 4) \qquad g(x - 4)$$

$$\begin{aligned} 5(x + 4)^2 - 2(x + 4) + 3 \\ = 5x^2 + 38x + 75 \end{aligned}$$

$$\begin{aligned} 5(x - 4)^2 - 2(x - 4) + 3 \\ = 5x^2 - 42x + 91 \end{aligned}$$

$$g(3x)$$

$$\begin{aligned} 5(3x)^2 - 2(3x) + 3 \\ = 45x^2 - 6x + 3 \end{aligned}$$

$$g\left(\frac{1}{3}x\right)$$

$$\begin{aligned} 5\left(\frac{1}{3}x\right)^2 - 2\left(\frac{1}{3}x\right) + 3 \\ = \frac{5}{9}x^2 - \frac{2}{3}x + 3 \end{aligned}$$

Worked example

Write the valid domain for:

$$f(x) = \sqrt{x}$$

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

$$h(x) = \frac{\sqrt{x}}{x-4}$$

Your turn

Write the valid domain for:

$$h(x) = \frac{\sqrt{x}}{x-3}$$

$$x \geq 0, x \neq 3$$

Worked example

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

The domain of $f(x)$ is $\{1, 4, 9, 16\}$.
What is the range?

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

The domain of $f(x)$ is $\{1, 2, 3, 4\}$.
What is the range?

Your turn

$$h(x) = 2x^3 + 1$$

The domain of $h(x)$ is $\{1, 2, 3, 4\}$.
What is the range?

$\{3, 17, 55, 129\}$