Functions and equations

ANSWERS

1

$f(x) = 2x + 1$ and $g(x) = x - 3$.
Solve $fg(x) = 11$.

$fg(x) = 2(x - 3) + 1$

$2x - 5 = 11$

$x = 8$

Answer $x = 8$

2

$f(x) = 3x - 2$ and $g(x) = x + 4$.
Solve $gf(x) = 17$.

$gf(x) = (3x - 2) + 4$

$3x + 2 = 17$

$x = 5$

Answer $x = 5$

3

$f(x) = x^2$ and $g(x) = x + 1$. Solve $fg(x) = 9$.

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

$(x + 1)^2 = 9$

$x = 2, x = -4$

Answer $x = 2, x = -4$

4

$f(x) = 4x + 3$. Solve $f^{-1}(x) = 5$.

$x = 23$

Answer $x = 23$

5

$f(x) = x^2 - 5$ and $g(x) = 4x$. Solve $f(x) = g(x)$.

$x^2 - 4x - 5 = 0, (x - 5)(x + 1) = 0$

Answer $x = 5, x = -1$

6

$f(x) = 3x - 8$. Solve $f(x) = f^{-1}(x)$.

$f^{-1}(x) = \frac{x + 8}{3}$; $9x - 24 = x + 8$

Answer $x = 4$

7

$f(x) = x^2$ and $g(x) = x + 2$. Solve $fg(x) = gf(x)$.

$(x + 2)^2 = x^2 + 2$; $4x + 4 = 2$

Answer $x = -\frac{1}{2}$

8

$f(x) = ax + 1$ and $g(x) = x + 2$.
Given that $fg(3) = 21$, find the value of a.

$g(3) = 5$, so $5a + 1 = 21$

Answer $a = 4$

Functions and equations *further practice*

ANSWERS

9

$f(x) = 5x - 1$ and $g(x) = 2x$.
Solve $fg(x) = 29$.

$fg(x) = 10x - 1$

Answer $x = 3$

10

$f(x) = x + 3$ and $g(x) = x^2$. Solve $gf(x) = 16$.

$(x + 3)^2 = 16$, so $x + 3 = 4$ or -4

Answer $x = 1, x = -7$

11

$f(x) = \frac{x + 5}{2}$. Solve $f^{-1}(x) = 7$.

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

Answer $x = 6$

12

$f(x) = x^2 + 2x$ and $g(x) = x - 1$.
Solve $fg(x) = 0$.

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

Answer $x = 1, x = -1$

13

$f(x) = x^2 - 3x$ and $g(x) = 2x - 6$.
Solve $f(x) = g(x)$.

$x^2 - 5x + 6 = 0$

Answer $x = 3, x = 2$

14

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

$f^{-1}(x) = \frac{3x + 1}{2}$; $4x - 2 = 9x + 3$

Answer $x = -1$

15

$g(x) = x^2 + 1$ and $h(x) = 3x - 1$.
Solve $gh(x) = 5$.

$(3x - 1)^2 = 4$, so $3x - 1 = 2$ or -2

Answer $x = 1, x = -\frac{1}{3}$

16

$f(x) = 2x$ and $g(x) = x + 5$.
Lia says $fg(x) = 2x + 5$, so $fg(x) = 15$ gives $x = 5$. Explain her mistake and solve $fg(x) = 15$.

fg means g first, then f:
$2(x + 5) = 2x + 10 = 15$

Answer $x = 2.5$