Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- $5(3) + 2$

$$= \mathbf{17}$$

2.2

- $y = 5x + 2$, so $x = \dfrac{y - 2}{5}$

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

2.3

- do g first, then f: $f(x + 3) = 2(x + 3)$

$$= \mathbf{2x + 6}$$

2.4

- $g(-3) = (-3)^2 + 1 = 9 + 1 = \mathbf{10}$

2.5

- $2x - 1 = 9$, so $2x = 10$

$$x = \mathbf{5}$$

3.1

(a)

- $f(2) = 3(2) - 4 = 2$
- then $g(2) = 2^2$

$$= \mathbf{4}$$

(b)

- do g first: $f\left(x^2\right) = 3x^2 - 4$

$$= \mathbf{3x^2 - 4}$$

- note $gf(x) = (3x - 4)^2$, which is not the same

(c)

- $y = 3x - 4$, so $x = \dfrac{y + 4}{3}$

$$f^{-1}(x) = \mathbf{\dfrac{x + 4}{3}}$$

3.2

- the denominator $x - 1$ must not be zero

$$x = \mathbf{1}$$

3.3

(a)

- $y = \dfrac{x + 5}{2}$, so $2y = x + 5$ and $x = 2y - 5$

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

(b)

- $f^{-1}(4) = 2(4) - 5 = \mathbf{3}$

3.4

- do g first: $fg(x) = 2(x^2 - 3) + 1 = 2x^2 - 5$
- $2x^2 - 5 = 13$, so $x^2 = 9$

$$x = \mathbf{3} \text{ or } x = \mathbf{-3}$$

3.5

(a)

- do f first: $gf(x) = 3\left(\dfrac{1}{x + 2}\right) - 1 = \dfrac{3}{x + 2} - 1$
- common denominator: $\dfrac{3 - (x + 2)}{x + 2}$

$$gf(x) = \mathbf{\dfrac{1 - x}{x + 2}}$$

(b)

- the numerator is zero: $1 - x = 0$, so $x = \mathbf{1}$

(c)

- $y = 3x - 1$, so $x = \dfrac{y + 1}{3}$

$$g^{-1}(x) = \mathbf{\dfrac{x + 1}{3}}$$