

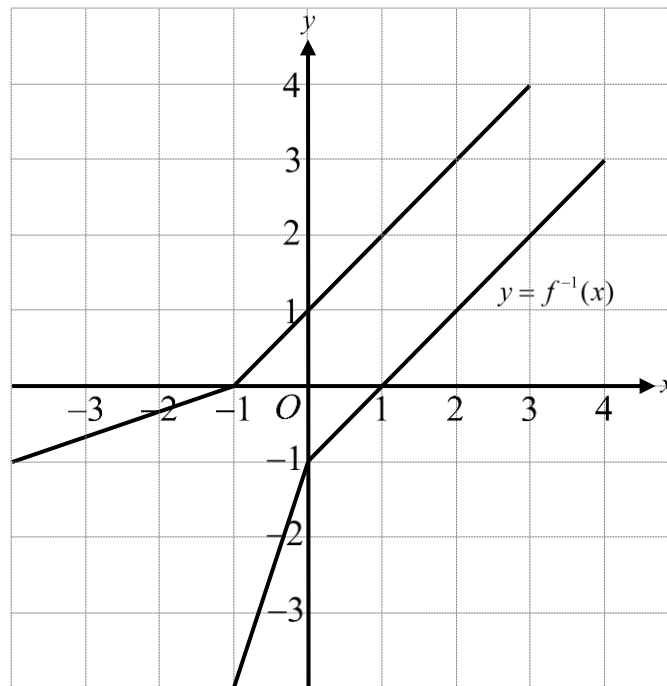
Chapter 3 Solution

Exercise 3

1. (a) (i) $f(2) = 3$ A1 N1
- (ii) $f^{-1}(-1) = -4$ A2 N2
- (b) For any two correct points from $(-1, -4)$, $(0, -1)$
or $(4, 3)$ M1
- For correct graph A2 N3

[3]

[3]



2. (a) (i) $f(-4) = 3$ A1 N1

(ii) $f^{-1}(-4) = 4$ A2 N2

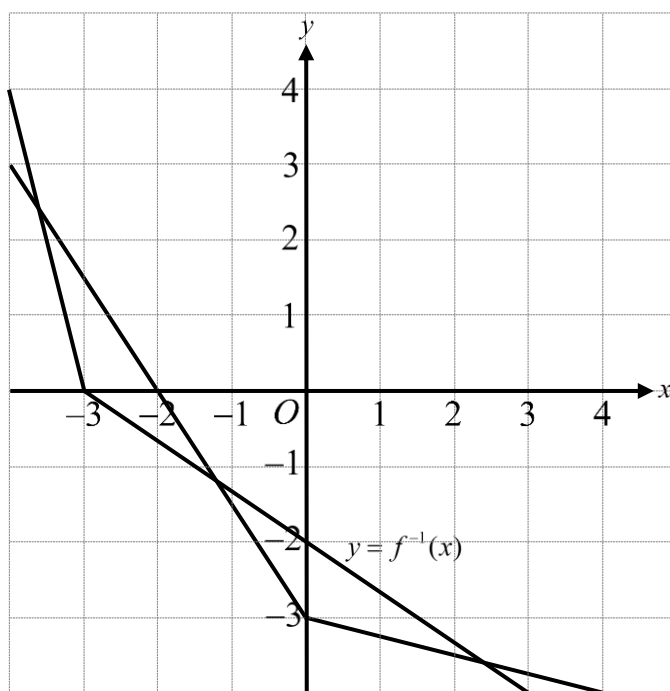
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(b) For any two correct points from $(-4, 4)$, $(-3, 0)$

or $(3, -4)$ M1

For correct graph A2 N3

[3]



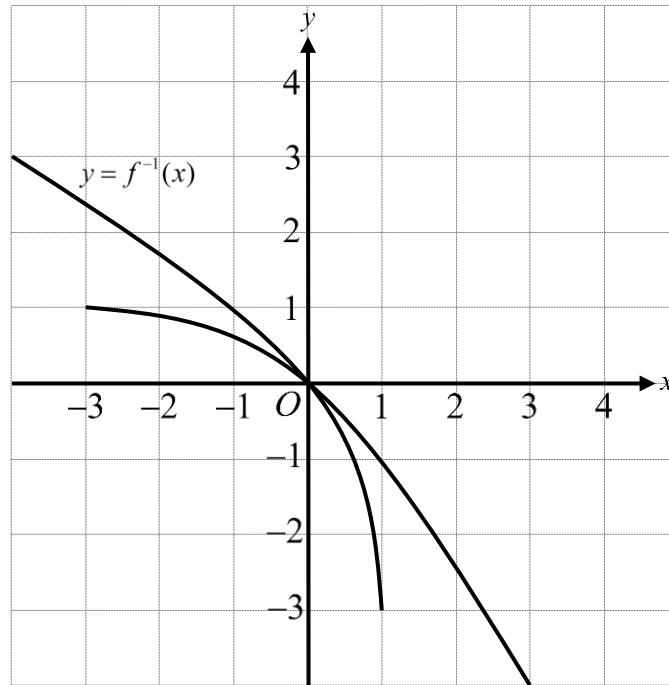
(c) When the displacement of the particle is -2 , its velocity is 0.

A1 N1

[1]

3. (a) For any two correct points from $(-4, 3)$, $(0, 0)$ or $(1, -3)$ M1
 For correct graph A2 N3

[3]



- (b) -1 A1 N1
 (c) 0 A1 N1
 (d) -4 A1 N1

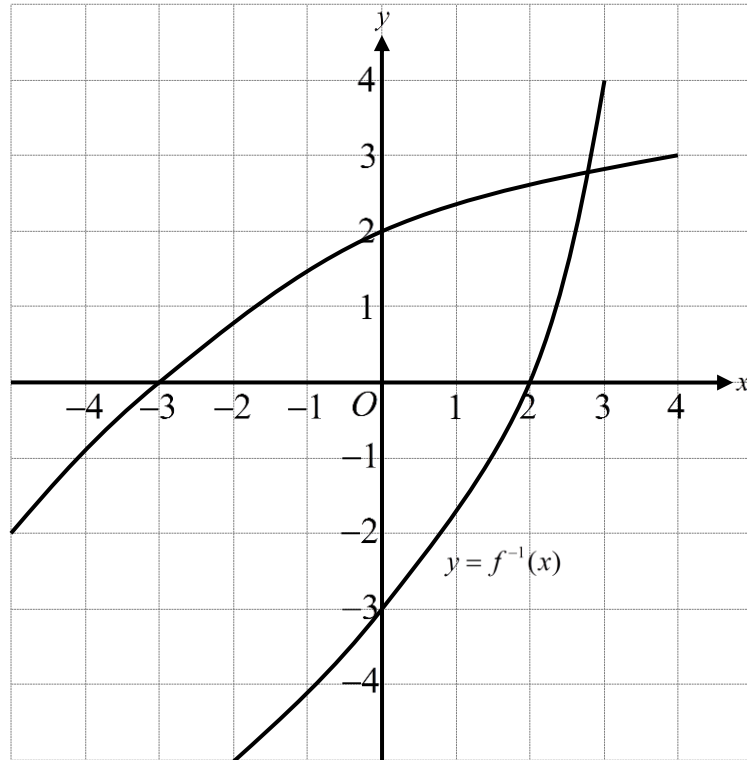
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4. (a) For any two correct points from $(-2, -5)$, $(0, -3)$,
 $(2, 0)$ or $(3, 4)$ M1
 For correct graph A2 N3

[3]



- (b) -4 A1 N1
 (c) 3 A1 N1
 (d) When the displacement of the car is 0, its velocity is 2. A1 N1

[1]

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Exercise 4

1. (a) $f(x) = 0$
 $\frac{2}{x+3} - 5 = 0$ (M1) for setting equation
 $\frac{2}{x+3} = 5$
 $x+3 = \frac{2}{5}$
 $x = -\frac{13}{5}$ A1 N2 [2]
- (b) $x = -3$ A2 N2 [2]
- (c) $y = -5$ A2 N2 [2]
2. (a) The y -intercept
 $= f(0)$ (M1) for substitution
 $= 3 - \frac{6}{1-0}$
 $= -3$ A1 N2 [2]
- (b) $x = 1$ A2 N2 [2]
- (c) $y = 3$ A2 N2 [2]

3. (a) $x = 5$ A2 N2 [2]
- (b) $y = 1$ A2 N2 [2]
- (c) $\{x : x \neq 5\}$ A1 N1 [1]
- (d) $f(x) > g(x)$
 $\frac{x+2}{x-5} > x$
 $\frac{x+2}{x-5} - x > 0$ M1
- By considering the graph of $y = \frac{x+2}{x-5} - x$,
 $x < -0.316625$ or $5 < x < 6.3166248$.
 $\therefore x < -0.317$ or $5 < x < 6.32$ A1 N2 [2]
4. (a) $x = \frac{5}{2}$ A2 N2 [2]
- (b) $y = \frac{7}{2}$ A2 N2 [2]
- (c) $\left\{y : y \neq \frac{7}{2}\right\}$ A1 N1 [1]
- (d) $f(x) \leq g(x)$
 $\frac{7x-1}{2x-5} \leq x-2$
 $\frac{7x-1}{2x-5} - x + 2 \leq 0$ M1
- By considering the graph of $y = \frac{7x-1}{2x-5} - x + 2$,
 $0.7596297 \leq x < \frac{5}{2}$ or $x \geq 7.2403703$.
 $\therefore 0.760 \leq x < \frac{5}{2}$ or $x \geq 7.24$ A1 N2 [2]

Exercise 5

1. (a) m represents the rate of change of the boiling point of water in degrees Celsius per 1 metre increase in vertical height above the sea level. A1 N1 [1]
- (b) $64 = 100 + m(10000)$ (M1) for substitution
 $-36 = 10000m$
 $m = -0.0036$ A1 N2 [2]
- (c) $84 = 100 - 0.0036x$ (M1) for substitution
 $-16 = -0.0036x$
 $x = 4444.444444$
 Therefore, the height is 4440 m. A1 N2 [2]
2. (a) b represents the initial number of hotels. A1 N1 [1]
- (b) $b = 143$ A1 N1
 $193 = a(5) + 143$ M1
 $50 = 5a$
 $a = 10$ A1 N2 [3]
- (c) The number of hotels
 $= 10(8) + 143$ (M1) for substitution
 $= 223$ A1 N2 [2]
3. (a) a represents the rate of change of the daily salary in dollars per 1 hour increase in working time. A1 N1 [1]
- (b) b represents the fixed daily salary. A1 N1 [1]
- (c) $b = 200$ A1 N1
 $600 = a(8) + 200$ M1
 $400 = 8a$
 $a = 50$ A1 N2 [3]
- (d) The daily salary
 $= 50(0.5) + 200$ (M1) for substitution
 $= \$225$ A1 N2 [2]

4. (a) p represents the rate of change of the area of the aluminium lamina in mm^2 per 1 degree Celsius increase in temperature. A1 N1 [1]
- (b) q represents the area of the aluminium lamina at 0°C . A1 N1 [1]
- (c) $q = 5$ A1 N1
 $8 = p(60) + 5$ M1
 $3 = 60p$
 $p = 0.05$ A1 N2 [3]
- (d) The difference of the areas
 $= 0.05(140)$ (M1) for substitution
 $= 7 \text{ mm}^2$ A1 N2 [2]