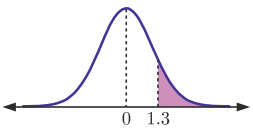
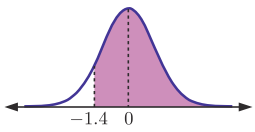
e



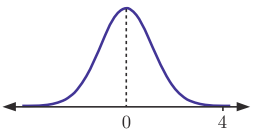
0.096 8

f



0.919

g

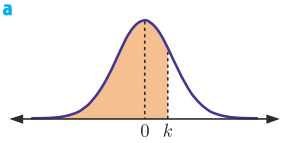


3.17×10^{-5}

6 **a** **i** $z_1 \approx -0.859$, $z_2 \approx 1.18$ **ii** 0.687

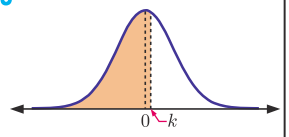
EXERCISE 24D.1

1 **a**



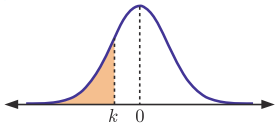
$k \approx 0.878$

b



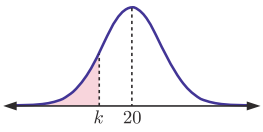
$k \approx 0.202$

c



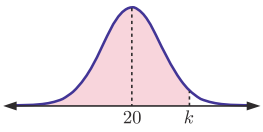
$k \approx -0.954$

2 **a**



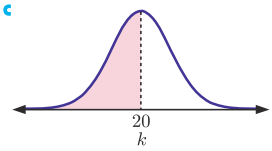
$k \approx 18.8$

b



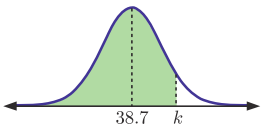
$k \approx 23.5$

c



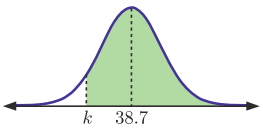
$k = 20$

3 **a**



$k \approx 49.2$

b



$k \approx 31.8$

4 **a** $a \approx 21.4$ **b** $a \approx 21.8$ **c** $a \approx 2.82$

5 82.9 **6** 24.7 cm **7** 75.2 mm **8** 65.6%

9 between 502 mL and 504 mL

EXERCISE 24D.2

1 112.4 **2** 0.193 m **3** \$96.50 **4** 4:01:24 pm

5 **a** $\mu \approx 52.4$, $\sigma \approx 21.6$ **b** $\mu \approx 52.4$, $\sigma \approx 21.6$, 54.4%

6 **a** $\mu \approx 4.00$ cm, $\sigma \approx 0.003\,53$ cm **b** 0.604

7 **a** $\mu = 2.00$ cm, $\sigma = 0.0305$ cm **b** 0.736

REVIEW SET 24A

1 **a** 2.28% **b** 95.4% **c** 68.3%

2 **a** **i** 2.28% **ii** 84% **b** 0.341

3 **a** $a = 6.3$ grams **b** $b \approx 32.3$ grams

4 **a** Harri's score is 2 standard deviations below the mean.
b 97.7% **c** 17

5 $k \approx 2$ **6** 29.5 m **7** **a** 0.136 **b** 0.341

8 **a** 2.28% **b** 84.1% **c** 81.9%

REVIEW SET 24B

1 **a** 68.3% **b** 95.4% **c** 81.9% **d** 13.6%

2 **a** **i** 81.9% **ii** 84.1% **b** 0.477 **c** $x \approx 61.9$

3 $\mu \approx 31.2$ mm

4 **a** $\mu = 29.0$, $\sigma \approx 10.7$ **b** **i** 0.713 **ii** 0.250

5 **a** 6.68% **b** 0.854

6 **a** 1438 candidates **b** 71.1 marks

7 **a** 0.260 **b** 29.3 weeks

8 **a** $\mu = 61.2$, $\sigma \approx 22.6$ **b** ≈ 0.244

9 **a** The relative difficulty of each test is not known.
b z-score for English $= 1$, z-score for Chemistry $= 1$
$\therefore$ Kerry's performance relative to the rest of the class is the same in both tests.

REVIEW SET 24C

1 **a** mean is 18.8, standard deviation is 2.6 **b** 13.6 to 24.0

2 **a** 0.364 **b** 0.356 **c** $k \approx 18.2$

3 0.207 **4** $\mu \approx 80.0$ cm **5** 0.0708

6 **a** 68.3% **b** 0.0884 **7** $\sigma \approx 0.501$ mL **8** 0.403

EXERCISE 25A

1 **a** $r = 3$ **b** 2×3^{19} **2** **Hint:** $u_1 = \ln 2 = d$

3 **a** $b^2 x$ **b** $2 \ln b + x$ **c** $x = \dfrac{2 \ln b}{b^2 - 1}$

4 **a** $(b, 2)$ **b** y-intercept is $2 - 2b^2$, x-intercepts are $b \pm 1$
c **i** $b = -2$ **ii** $b < -2$ **iii** $b = \dfrac{1 \pm \sqrt{17}}{4}$

5 **a** $x^3 - 6x^2 + 12x - 8$ **b** 29

6 **a** 1 **b** 3 **c** $\{x \mid x \leqslant \frac{1}{2},\ x \in \mathbb{R}\}$
d $\{y \mid y \geqslant 0,\ y \in \mathbb{R}\}$

7 **a** a **b** $-b$ **c** a **d** $\dfrac{a}{\sqrt{1 - a^2}}$

8 **a** $x = 0, \pi, 2\pi$ **b** $x = \frac{\pi}{3}, \frac{5\pi}{3}$

9 **a**

Constant	a	b	c	d	e	h
Sign	> 0	< 0	> 0	< 0	> 0	$= 0$

Constant	Δ of $f(x)$	Δ of $g(x)$
Sign	< 0	> 0

10 **a** $\frac{\pi}{3}$ **b** 6 cm

11 **a** no
b 3 is not in the range of f. In fact, the range is $\{y \mid y \geqslant 6\}$.

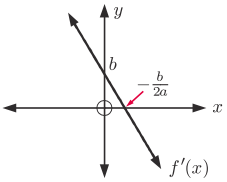
12 **a** $p = 1$ **b** $\sqrt{6p^2 + 60}$

13 **a** $\overrightarrow{BA} = \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix}$, $\overrightarrow{BC} = \begin{pmatrix} 1 \\ 1 \\ -3 \end{pmatrix}$ **b** both are $\sqrt{11}$ units
c a rhombus **d** **i** $\frac{1}{11}$ **ii** $\frac{\sqrt{120}}{11}$ **iii** $2\sqrt{30}$ units^2

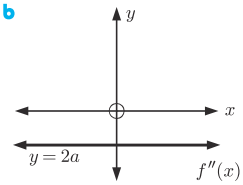
14 **a** g **b** **i** $m-a$ **ii** $\left(\frac{j+k}{2}\right)-\left(\frac{c+d}{2}\right)$

15 **a** 35, 6.4 **b** 19.5, 3.2 **c** 57.5, 9.6

17 **a**

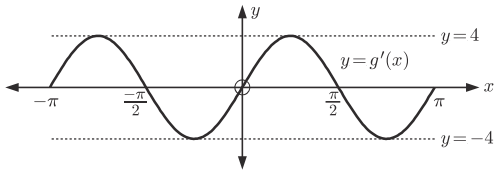


b



18 **a** $g'(x)=4\sin(2x)$

b

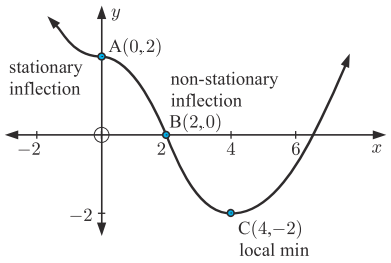


c $x=-\pi,\ -\frac{\pi}{2},\ 0,\ \frac{\pi}{2},\ \pi$ $\therefore$ 5 solutions

d M is at $(-\pi,\ 0)$, $(0,\ 0)$, or $(\pi,\ 0)$

19 **a** $\mathrm{P}(A\cup B)=x+0.57$ **b** $x=0.16$

20



21 **b** $\left(\frac{1}{2},\ \frac{1}{2}\right)$ **c** **i** $x>0$ **ii** $x<\frac{1}{2}$

22 **a** $v(t)=k-8e^{2t}\ \mathrm{m\,s^{-1}}$ **b** $k=72$

23 **a** $x=3$ **b** $x=\dfrac{5-\ln 8}{2}$ **c** $x=3$

24 **a** $1\ \mathrm{m\,s^{-1}}$, the initial velocity

b 0, uniform (constant) velocity

c 4, 4 m displacement on $1\leqslant t\leqslant 3$

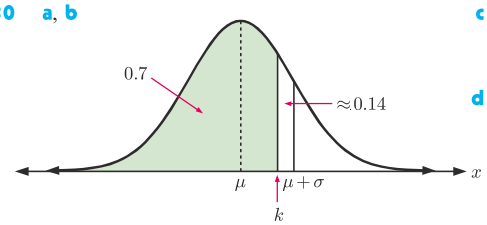
25 **a** -8 **b** $k=\frac{1}{2}$ **26** **b** $\frac{\pi}{4}-\frac{1}{2}$ **27** $a=0.3,\ b=0.2$

28 **a** $r=\dfrac{1}{e^2}$ **b** e^{-199} **c** $\dfrac{e^3}{e^2-1}$

29 **a** 15 **b** 15

c $x^6-12x^5+60x^4-160x^3+240x^2-192x+64$

30 **a, b**



c **i** 0.3

ii 0.2

iii 0.541

d 0.1

31 **a** 70%

b **i** $m\approx 27$ **ii** $n\approx 35$ **iii** $p\approx 42$ **iv** $q=100$

32 **a** $p=10\sqrt{3}$ **b** $x+\sqrt{3}y=40$

33 **a** $v(t)=t-\frac{3}{2}\sin(2t+\frac{\pi}{2})+6\frac{1}{2}\ \mathrm{cm\,s^{-1}}$

b $\dfrac{\pi+26}{4}\ \mathrm{cm\,s^{-1}}$

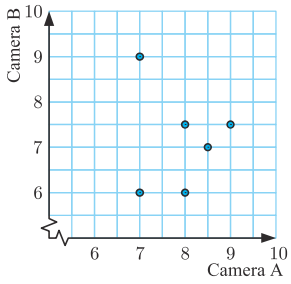
34 **b** $\frac{1}{3}\ln\left(\frac{7}{2}\right)$ **35** **a** $-\frac{\sqrt{21}}{5}$ **b** $-\frac{2}{\sqrt{21}}$ **c** $-\frac{4\sqrt{21}}{25}$

36 **a** $\frac{5}{2}\sqrt{2}$ **b** **i** $310+155\sqrt{2}$ **ii** $320+160\sqrt{2}$

37 **a** $\begin{pmatrix}-2\\2\\6\end{pmatrix}$ **b** $\sqrt{11}\ \mathrm{units\ s^{-1}}$

c $x=3-2t,\ y=1+2t,\ z=-2+6t,\ t\geqslant 0$

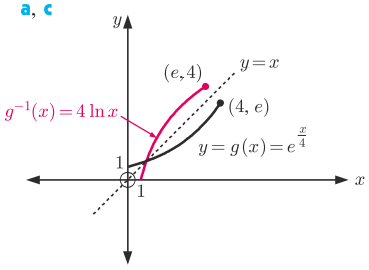
38 **a**



b yes (Camera A = 7, Camera B = 9)

c moderately consistent

39 **a, c**



b $\{y\mid 1\leqslant y\leqslant e\}$

d $\{x\mid 1\leqslant x\leqslant e\}$, $\{y\mid 0\leqslant y\leqslant 4\}$

e $g^{-1}(x)=4\ln x$

40 **b** **ii** RS $=5\sqrt{3}$ cm

iii perimeter $=15+5\sqrt{3}$ cm, area $=\frac{25}{2}\sqrt{3}\ \mathrm{cm^2}$

41 **a** $f'(x)=-\frac{1}{2}x+3$ **b** **i** $x+2y=20$ **ii** (12, 4)

c **i** $\int_2^6(-\frac{1}{4}x^2+3x+4)\,dx$ **ii** $46\frac{2}{3}\ \mathrm{units^2}$

iii $\pi\int_2^6(-\frac{1}{4}x^2+3x+4)^2\,dx$

42 **a** **i** $r=-3$ **ii** -4×3^{13}

b **i** $x=4$ or -1

ii $S=8$ when $x=4$; when $x=-1$, S does not exist

c **i** -55 **ii** -2300

43 **a** $\begin{pmatrix}-1\\-3\\-7\end{pmatrix}$ **b** $\frac{1}{\sqrt{59}}\begin{pmatrix}1\\3\\7\end{pmatrix}$ **c** no

d $a=\frac{1}{5}$ **e** $\overrightarrow{\mathrm{OM}}=\frac{1}{2}(5\mathbf{i}+\mathbf{j}-9\mathbf{k})$

f $\mathbf{r}_1=\frac{1}{2}\begin{pmatrix}5\\1\\-9\end{pmatrix}+t\begin{pmatrix}3\\2\\-1\end{pmatrix},\ t\in\mathbb{R}$

g **i** $\begin{pmatrix}3\\2\\-1\end{pmatrix}\neq k\begin{pmatrix}2\\-3\\1\end{pmatrix}$ for some $k\in\mathbb{R}$

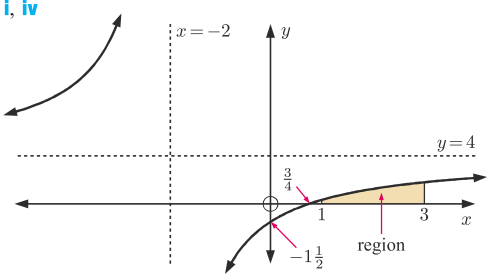
ii $m=-45\frac{1}{2}$ **iii** $\mathrm{P}(-30\frac{1}{2},\ -21\frac{1}{2},\ 6\frac{1}{2})$

44 **a** $\tan^{-1}\left(\frac{1}{2}\right)$ **b** $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

45 **a** **i** $a=-1$ **ii** $x=6$ **iii** 16

b **i** $y = 12 - x$ **ii** $y^2 = x^2 + 64 - 16x\cos\theta$
vi $8\sqrt{5}$ units^2 when $x = y = 6$ **vii** isosceles

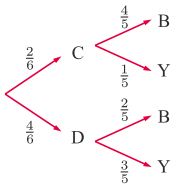
46 **a** $f^{-1}(x) = \dfrac{x+3}{4}$, $g^{-1}(x) = x - 2$
b $(f \circ g^{-1})(x) = 4x - 11$ **c** $x = \frac{47}{15}$
d **i, iv**



ii $A = 4$, $B = -11$ **iii** $12 - 11\ln 4$

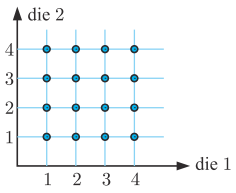
47 **a** The probabilities do not add to 1.
b $a + b = 0.3$, $0 \leqslant a \leqslant 0.3$, $0 \leqslant b \leqslant 0.3$
c **i** 0.16 **ii** 0.84

48 **a**



b $\frac{2}{5}$
c $\frac{7}{15}$
d $\frac{1}{2}$
e \$7.40

49 **a**



b $X = 2, 3, 4, 5, 6, 7, 8$
c **i** $\frac{3}{16}$
ii $\frac{5}{8}$
d $d = 8\frac{1}{3}$

50 **a** 0 cm s^{-2}, $\left(\frac{3\pi}{2} - 1\right)$ cm s^{-2}
b $v(t) = \frac{3}{2}t^2 + \cos t + 2$ cm s^{-1}
c $\left(\frac{\pi^3}{16} + \pi + 1\right)$ cm, which is positive as $\pi > 3$.
d The integral is the displacement in the first $\frac{\pi}{2}$ seconds.

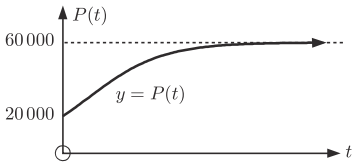
51 **a** $a = 7$, $b = \frac{\pi}{8}$, $c = 1$, $d = 10$
b **i** A′(7, 28) **ii** $y = 14\sin\frac{\pi}{8}(x - 3) + 14$
iii a vertical stretch of factor $\frac{1}{2}$, followed by a translation of $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$.

52 **a** $(2^x + 4)(2^x - 5)$ **b** $x = \log_2 5$
c **i** $x = \dfrac{1}{p}$ **ii** $x = \dfrac{1}{3p+1}$

53 **b** $2a - b$ when $x = \frac{3\pi}{4}, \frac{7\pi}{4}$
c Max TPs: $(0, a)$, (π, a), $(2\pi, a)$
Min TPs: $(\frac{\pi}{2}, b - a)$, $(\frac{3\pi}{2}, b - a)$

54 **c** $S(x)$ **d** $\dfrac{1}{[C(x)]^2}$

55 **a** $P(0) = 20\,000$ **b** $P'(t) = \dfrac{30\,000\,e^{-\frac{t}{4}}}{(1 + 2e^{-\frac{t}{4}})^2}$
c Use the fact that $e^{-\frac{t}{4}}$ is never negative.
$P(t)$ is increasing for all $t \geqslant 0$
d $P''(t) = \dfrac{7500e^{-\frac{t}{4}}(2e^{-\frac{t}{4}} - 1)}{(1 + 2e^{-\frac{t}{4}})^3}$
e 3750 per year when $t = 4\ln 2$ years **f** $P(t) \to 60\,000^-$
g



56 **a** $-\frac{1}{3}e^{1-x^3} + c$

57 **a** $\{y \mid -1 \leqslant y \leqslant 1\}$ **b** 2 solutions
c $-3\sin x\cos^2 x$ **d** π units^3

58 **a** 25 sin α cm^2 **b** $\left(\frac{25\pi}{2} - 25\sin\alpha\right)$ cm^2
c $A_{\max} = \frac{25\pi}{2}$ cm^2 when $\alpha = 0$ or π
$A_{\min} = 25(\frac{\pi}{2} - 1)$ cm^2 when $\alpha = \frac{\pi}{2}$

59 **a** **i** $h = 4$ **ii** $k = 18$ **iii** $a = -2$ **b** $18\frac{2}{3}$ units^2

60 **a** **i** $x = 1$ **ii** $x = \sqrt[5]{7}$ **b** $x = 0$ or 1

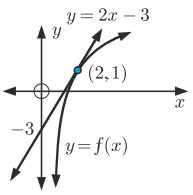
61 **a** **ii** $\theta = \frac{\pi}{3}$ **b** $\cos x = \frac{1-\sqrt{3}}{2}$

62 $u_1 = 2$, $u_n = 3n^2 - 3n + 3$, $n > 1$

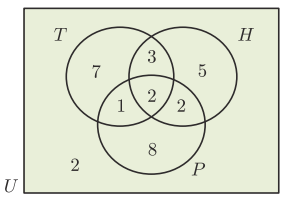
63 $x = -\frac{3\pi}{2}$ or $\frac{\pi}{2}$ **64** **a** $-e^2$ **b** $e^2 - 3$

65 $(0, -1, -1)$

66 **a** $y = 2x - 3$
c $f'(x) > 0$ for all $x \in \mathbb{R}$
$\therefore$ $f(x)$ is monotone increasing
d $\frac{3}{2} < x < 2$
b



67 **a**



b **i** $\frac{5}{30} = \frac{1}{6}$
ii $\frac{13}{30}$
iii $\frac{8}{30} = \frac{4}{15}$
iv $\frac{23}{30}$
v $\frac{1}{30}$

69 $a = \frac{1}{2}$ **70** $\mathrm{P}(A \cup B) = 1$ or $\mathrm{P}(A \cap B) = 0$

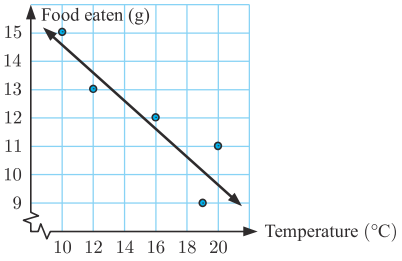
71 $\theta = -\frac{11\pi}{12}, -\frac{7\pi}{12}, \frac{\pi}{12}, \frac{5\pi}{12}$

72 **a** $\{x \mid x < 0$ or $x > 2\}$ **b** $\dfrac{1}{x} + \dfrac{1}{x-2}$
c $4x - 3y = 12 - 3\ln 3$

73 **a** $\frac{24}{49}$ **b** $\frac{16}{25}$ **74** **a** ≈ 0.341 **b** $\sigma \approx 5$

75 $a = \frac{3}{5}$ **76** $\dfrac{8}{x}$

77 **a, d**



b strong, negative, linear correlation
c $(\overline{x}, \overline{y}) = (15.4, 12)$ **e** $F \approx -0.47t + 19.2$
f 16.9 grams **g** may be unreliable as it is an extrapolation

78 **a** $(0, 4)$, a translation of $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$
b $(0, 6)$, a translation of $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ followed by a vertical stretch of factor 2
c $(-1, 0)$, a translation of $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ followed by a horizontal stretch of factor $\frac{1}{2}$
d $(3, -2)$, a reflection in $y = x$

79 $y = 4\sin\left(\frac{\pi}{2}x\right) - 1$ **80** **a** $x = 0$ **b** $x = 0.2$ or 0.3

81 **a** 121 **b** 2

82 **a** **i** 4 kg **ii** 2.1 kg
c ≈ 4.25 kg

b

Weight (w grams)	*Frequency*
$0 \leqslant w < 1$	1
$1 \leqslant w < 2$	2
$2 \leqslant w < 3$	5
$3 \leqslant w < 4$	12
$4 \leqslant w < 5$	8
$5 \leqslant w < 6$	6
$6 \leqslant w < 7$	3
$7 \leqslant w < 8$	2
$8 \leqslant w < 9$	1

83 **a** $\dfrac{3x}{x-2}$ **b** $\dfrac{2x+1}{x-1}$ **84** **a** $\frac{13}{21}$ **b** $\frac{11}{21}$

85 $x = \dfrac{2}{a^2 - 1}$

86 **a** $a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5$ **b** 1
c $32x^5 + 80x^3 + 80x + \dfrac{40}{x} + \dfrac{10}{x^3} + \dfrac{1}{x^5}$

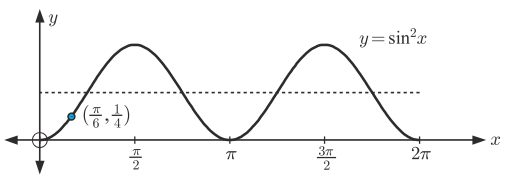
87 **a** $a^2 - 2$ **b** $a^3 - 3a$

88 **a** **i** A$(4, 0)$, B$(-4, 0)$ **ii** C$(0, 2)$, D$(0, -2)$
b $y = \sqrt{4 - \dfrac{x^2}{4}}$ **c** area $= 4\displaystyle\int_0^4 \sqrt{4 - \frac{x^2}{4}}\,dx$
d volume $= \frac{64\pi}{3}$ units^3

89 **a**

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$f(0)$	0	$\frac{1}{2}$	1	$\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{1}{2}$	0

b

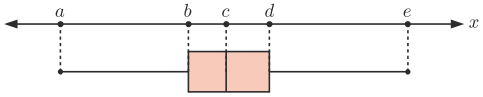


c when $x = \frac{\pi}{6}$, $y = \frac{1}{4}$ ✓ **d** $\{y \mid 0 \leqslant y \leqslant 1\}$
e $\frac{\pi}{2}$ units^2 **f** $x - y = \frac{\pi}{4} - \frac{1}{2}$

90 **a** $f'(x) = 1 - x^{-2}$, $x = 1$ **b** A$(1, 2)$ **c** .... is at least 2
d **i** no solutions **ii** one solution **iii** two solutions

91 **a** $\mathbf{r} = \begin{pmatrix} 2 \\ 0 \\ -3 \end{pmatrix} + t\begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$, $t \in \mathbb{R}$
b $x = 2 + t$, $y = -t$, $z = -3 + 2t$, $t \in \mathbb{R}$
c it represents any point on the line **d** $\begin{pmatrix} t+3 \\ -t-3 \\ 2t-8 \end{pmatrix}$
e $6t - 10$ **f** $t = \frac{5}{3}$ **g** $\left(\frac{11}{3}, -\frac{5}{3}, \frac{1}{3}\right)$

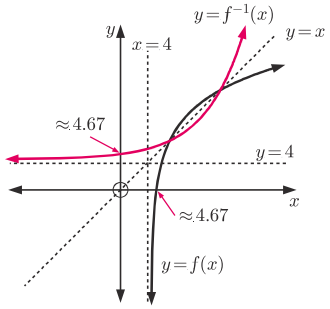
92 **a** **i** a is the minimum value of X **ii** b is Q_1
iii c is the median **iv** d is Q_3
v e is the maximum value of X
b **i** the range **ii** the IQR **c** **i** 0.5 **ii** 0.75
d



EXERCISE 25B

1 $n = 30$

2 **a, c**



b $x \approx 4.82$ **d** $x + 5y = 15$

3 $-\frac{84}{125}$

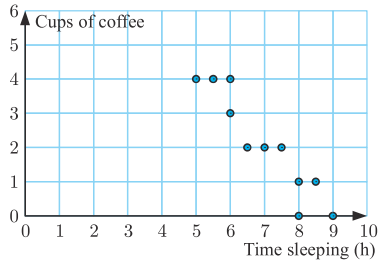
4 **a** \$7500 **b** **i** \$10 245 **ii** \$19 118
c 36.6% increase **d** ≈ 11.1 years

5 **a** 1950 **b** 10 500

6 **a** $x = \pm 1$ **b** $x = \pm\frac{3}{2\sqrt{5}}$ **c** $x = -\frac{1}{5}$
d $x = -\frac{1}{2}$ or $\frac{2}{5}$

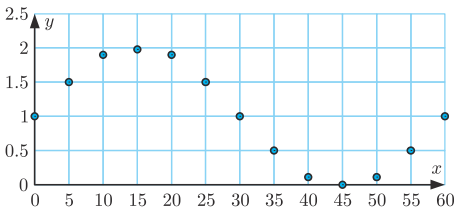
7 **a** $r \approx 35.4$ cm **b** ≈ 1530 cm^2 **c** 59.4 cm

8 **a**



b $r \approx -0.937$ **c** strong, negative correlation

9 **a**



b **i** $y = 1$ **ii** 2 **iii** 60 **iv** 1

c $y = \sin\left(\frac{\pi}{30}x\right) + 1$

10 **a** $m = 4,\ n = \frac{\pi}{4},\ p = 1,\ r = 8$ **b** ≈ 5.17

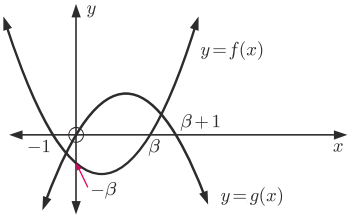
c $x = 2\frac{1}{3}$

11 **a** $\approx 30.9°$ **c** No, as equations have inconsistent solutions

d $(-8,\ 2\frac{1}{2},\ -\frac{1}{2})$ **e** $a = -5\frac{1}{2}$

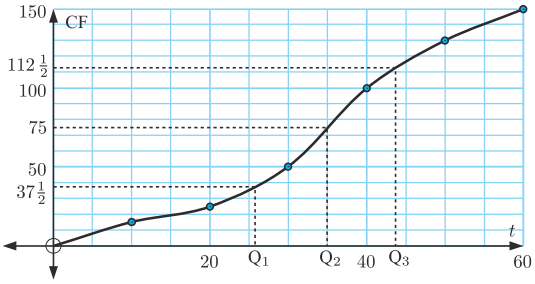
12 **a** x-intercepts are -1 and β, y-intercept is $-\beta$

b, c



13 **a**

Time (min)	*f*	*Cumulative frequency*
$0 < t \leqslant 10$	15	15
$10 < t \leqslant 20$	10	25
$20 < t \leqslant 30$	25	50
$30 < t \leqslant 40$	50	100
$40 < t \leqslant 50$	30	130
$50 < t \leqslant 60$	20	150



b **i** ≈ 35 min **ii** ≈ 17.5 min **iii** ≈ 0.5

14 $\frac{37}{675} \approx 0.0548$

15 **a** $(0.86)^5 \approx 0.470$

b No, it is $\binom{5}{3}(0.86)^3(0.14)^2$ where $\binom{5}{3} = 10$.

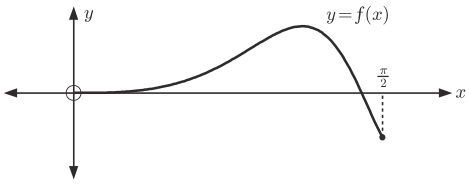
16 $\frac{1}{2}$

17 **a** z-score for 100 m ≈ -1.86 **b** the 100 m

z-score for 200 m ≈ -1.70

18 **a** 0, ≈ 1.46

b



c $y \approx 1.64x - 0.820$ **d** P(0.955, 0.544)

19 **a** **i** $\frac{1208}{1797} \approx 0.672$ **ii** $\frac{415}{589} \approx 0.705$

b Method is OK. Although not strictly binomial, the binomial distribution is very close in this case.

20 **a** $-12e^{1-4x}$ **b** $-\frac{3}{4}e^{1-4x} + c$ **c** ≈ 2.04

21 **a** A(1, 0), B(π, 0) **b** C(2.128, 0.641)

c (1.101, 0.086) **d** a non-stationary inflection

22 **a** 185 months **b** ≈ 370 months

23 **a** $+ 80x^4 + 80x^2 + 32$

b $\frac{1}{11}x^{11} + \frac{10}{9}x^9 + \frac{40}{7}x^7 + 16x^5 + \frac{80}{3}x^3 + 32x + c$

24 **a** $f(x) = -4(x-1)^2 + 4$ **b** $x \approx 0.106$ and $x \approx 1.89$

c **i** $A \approx \int_{0.106}^{1.89} [f(x) - g(x)]\,dx$ **ii** ≈ 4.77 units^2

25 **b** P(B) = 0.6, P(A) = 0.2

26 **a** $\overline{x} = 70.5$ kg **b** 76 kg

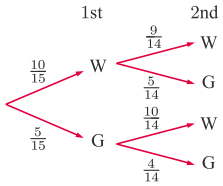
c **i** $\sigma \approx 15.1$ kg

ii ≈ 1.92 standard deviations above the mean

27 **a** ≈ 0.0355 **b** ≈ 0.974

28 **a** **i** ≈ 0.544 **ii** ≈ 0.456 **b** **i** $(0.97)^n$ **ii** $n = 12$

29 **a** **i**



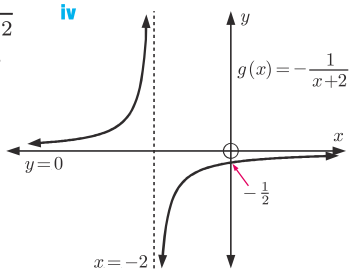
ii $\frac{11}{21}$ **b** $n = 6$

30 $\mu \approx 679$ kg, $\sigma \approx 173$ kg **31** **a** 4 horses **b** 11.4 days

32 **a** $z = 0.1$ **b** $y = 0.1$ **c** $x = 0.7$

33 **a** $m = -1,\ n = 2$

b **i** $g(x) = -\dfrac{1}{x+2}$ **iv**



ii VA is $x = -2$, HA is $y = 0$

iii $-\frac{1}{2}$

34 **a** **i** $(-1,\ 3)$ **ii** $(39,\ 23)$ **b** ≈ 44.7 m **d** no

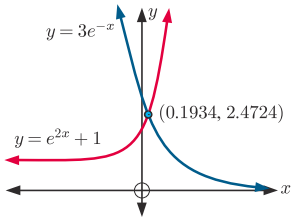
35 $k \approx -0.969$

36 **a** A(0, 1), B$\left(2,\ \dfrac{1}{e^4}\right)$ **b** ≈ 0.882 units^2

37 **a** 0.8 **b** **i** ≈ 0.0881 **ii** ≈ 0.967

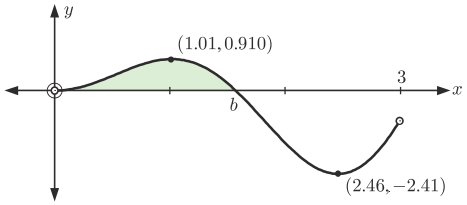
38 **a** $\mu \approx 40.4$ **b** ≈ 0.0117 **c** $a \approx 55.8$

39 **a**



b $x \approx 0.1934$

40 **a**



b Range is $\{y \mid -2.41 \leqslant y \leqslant 0.910\}$ **c** $b = \frac{\pi}{2}$
d $A \approx 0.785$

41 **b** $3x + e^{\frac{3\pi}{2}} y = 1 + \frac{3\pi}{2}$ **c** ≈ 0.0847 units^2

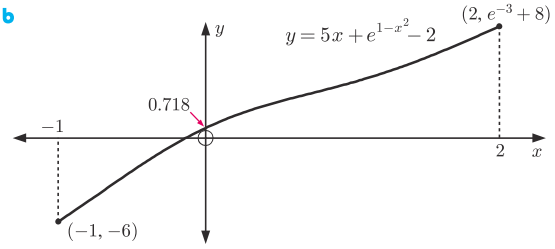
42 **b** $x = 0$, $x = \frac{\pi}{2}$ are VAs **c** 2 when $x = \frac{\pi}{4}$
d ≈ 2.046

43 **a** **i** ≈ 0.0362 **ii** ≈ 0.610 **iii** ≈ 0.566
b $k \approx 74.4$ **c** $a \approx 81.0$, $b \approx 102$ **d** ≈ 0.506

44 **a** $\begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$, $\sqrt{38}$ units **b** D(4, 3, 2)
c F(7, −4, −2) **d** 33, $\frac{11}{3\sqrt{38}}$ **e** $3\sqrt{221}$ units^2

45 **a** $t = \frac{1}{4}$ **b** 2.675 **c** It is the mean of the Y distribution.

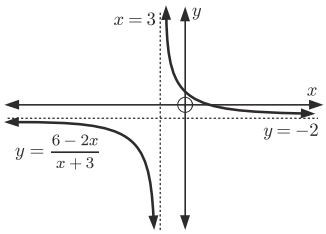
46 **a** $e - 2 \approx 0.718$
b



c ≈ -0.134 **d** 3

47 **a** $a \approx 17.2$, $b \approx 30.0$
b **i** ≈ 0.649 **ii** ≈ 0.334 **iii** 0.5

48 **a**



b as $x \to -3^-$, $y \to -\infty$
as $x \to -3^+$, $y \to \infty$
as $x \to \infty$, $y \to 2^+$
as $x \to -\infty$, $y \to 2^-$
VA is $x = -3$, HA is $y = -2$

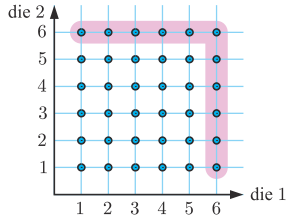
c $\lim\limits_{x \to -\infty} \dfrac{6-2x}{x+3} = -2$, $\lim\limits_{x \to \infty} \dfrac{6-2x}{x+3} = -2$

49 **a** A(−3, 4, −2) **b** Yes, at (4, −3, 5) **c** $\approx 75.0°$

50 **a** A(1, 0), B(2, 0), C(0, 2) **b** $y = 0$ is a HA
d local max. at $x \approx -0.618$, local min. at $x \approx 1.62$
f $x \approx 2.05$ **g** area ≈ 0.959 units^2

51 **a** 0 **b** $\left(1, \frac{1}{e}\right)$ **c** $\left(2, \frac{2}{e^2}\right)$ **d** ≈ 0.330 units^2

52 **a**



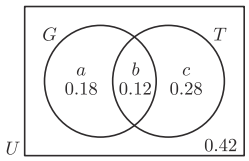
b $\frac{11}{36}$
c **i** ≈ 0.227 **ii** ≈ 0.635

53 **b** $a = -3\frac{1}{2}$, $b = 5$ **c** D(10, −11, 11)

54 **a** DB ≈ 4.09 m, BC ≈ 9.86 m
b $\widehat{\text{ABE}} \approx 68.2°$, $\widehat{\text{DBC}} \approx 57.5°$ **c** ≈ 17.0 m^2
d ≈ 10.9 m

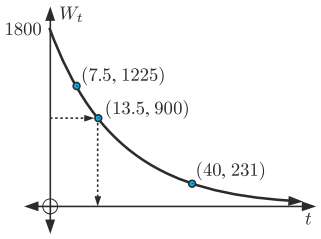
55 **a** $a = -1$, $b = 2$ **b** y-intercept is $-2\frac{1}{2}$
c $\frac{-1-\sqrt{21}}{2}$ and $\frac{-1+\sqrt{21}}{2}$ **d** D$(-\frac{1}{2}, -2\frac{1}{3})$
e **i** $A = -\displaystyle\int_{\frac{\sqrt{21}-1}{2}}^{k} \left(-1 + \frac{3}{x^2+x-2}\right) dx$
ii ≈ 0.558 units^2

56 **a** **i** The probability of a randomly selected customer buying both a goldfish and a tortoise is 0.12.
ii



iii G and T are independent since $\text{P}(G) \times \text{P}(T) = \text{P}(G \cap T)$
b **iii** $b \approx 0.104$, $a \approx 0.124$ **iv** ≈ 0.228

57 **a** 1800 g **b** **i** ≈ 1225 g **ii** ≈ 231 g
c

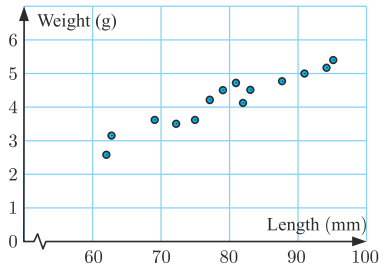


d ≈ 13.5 years **e** ≈ 56.3 years

58 **b** **i** $\approx 0.927^c$ **ii** $\approx 0.644^c$
c **i** ≈ 2.16 cm^2 **ii** ≈ 29.3 cm^2

59 **a** $x = 3$ **b** $x = \frac{\ln 2}{\ln 3}$ (or $\log_3 2$)

60 **a**



b $r \approx 0.962$ **c** very strong, positive linear correlation
d $y \approx 0.072\,9x - 1.57$ **e** **i** ≈ 6.45 g **ii** 3.53 g
f The prediction in **e ii** is more likely to be reliable, as it is an interpolation.

61 **a** $2p^2 - p^4$ **b** $p \approx 0.541$

62 **a** $\frac{3}{5}$ **b** 2.2 cm **c** Two - 5 cm or 2.2 cm

63 ≈ 6.40 cm **64** ≈ 0.114 **65** ≈ 0.842

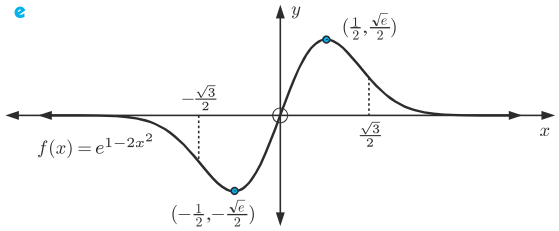
66 **a** $a = 13,\ b = 12,\ c = \frac{\pi}{30},\ d = 15$ **b** ≈ 24.9 m

67 **a** $a = 2,\ b = -\sqrt{3}$ **b** $x \approx -1.05,\ 0.524,\ 2.09$

68 **a** $x = \frac{\pi}{2}$ **b** $f''(x) = e^{\sin^2 x}(\sin^2 2x + 2\cos 2x)$
c $\approx (0.999,\ 2.03),\ \approx (2.14,\ 2.03)$

69 $31\frac{1}{7}$ or $47\frac{6}{7}$

70 **a** $f'(x) = e^{1-2x^2}(1-4x^2),\ f''(x) = e^{1-2x^2}(16x^3 - 12x)$
b local min at $\left(-\frac{1}{2}, \frac{-\sqrt{e}}{2}\right)$, local max at $\left(\frac{1}{2}, \frac{\sqrt{e}}{2}\right)$
c $x = 0$ or $\pm\frac{\sqrt{3}}{2}$
d as $x \to \infty,\ f(x) \to 0^+$
as $x \to -\infty,\ f(x) \to 0^-$
e



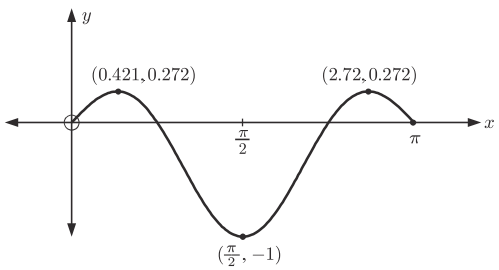
71 **a** $\overline{x} \approx 16.0$ **b** $\sigma \approx 2.48$

72 **b** **Hint:** $-1 \leqslant \cos\theta \leqslant 1$ for all θ.
c $\theta \approx 1.02,\ 2.59,\ 4.16,\ 5.73$

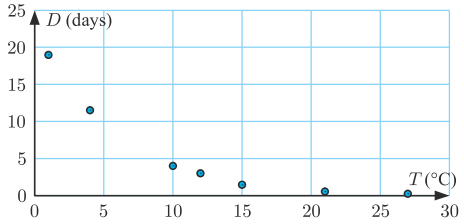
73 **a** no solutions exist **b** $x \approx 3.82$

74 **a** $k = 2$ **b** $\mu = 3.2$ **c** $\frac{47}{50}$

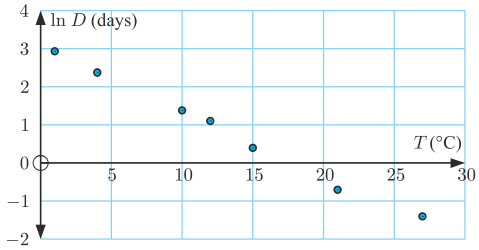
75 **a** $f'(x) = 6\cos^3 x - 5\cos x$
c local max. at $(0.421,\ 0.272)$, $(2.72,\ 0.272)$,
local min. at $(\frac{\pi}{2},\ -1)$
d



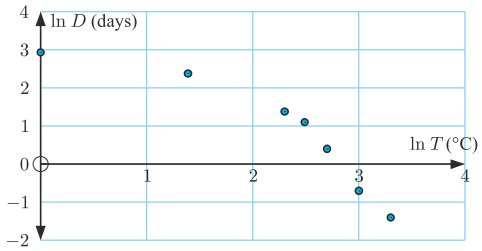
76 **a** **i**



ii



iii



b The graph of $\ln D$ against T illustrates a linear relationship.
The equation is $\ln D \approx -0.172T + 3.10$.
c $D \approx 22.2 \times (0.842)^T$ **d** ≈ 6.66 days