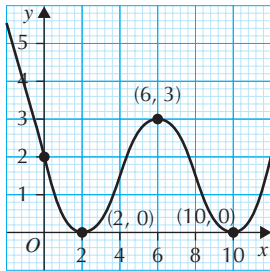


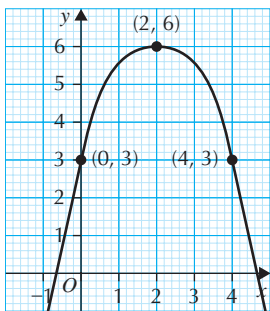
Chapter 3

Exercise 3A

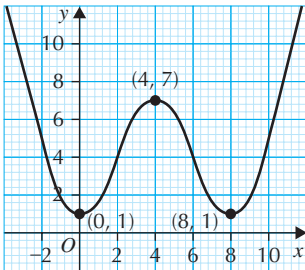
1 a



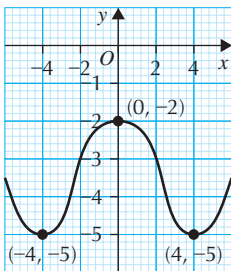
b



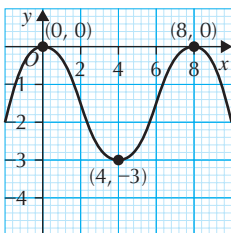
c



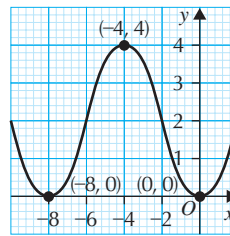
d



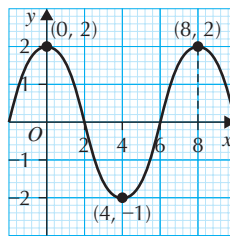
e



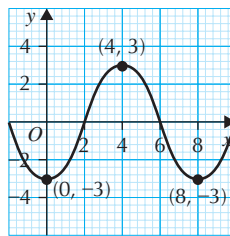
f



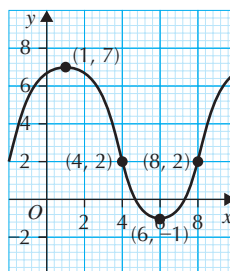
g



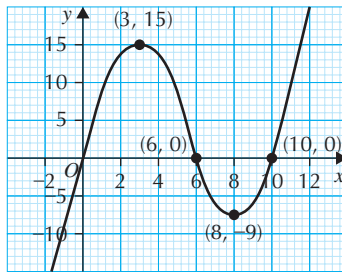
h



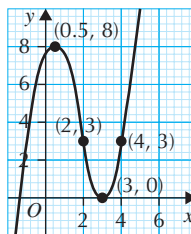
2 a

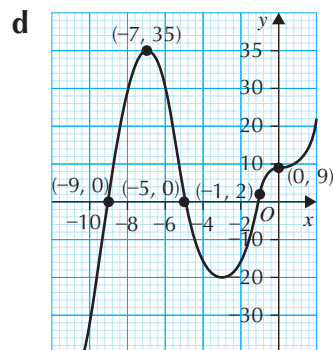
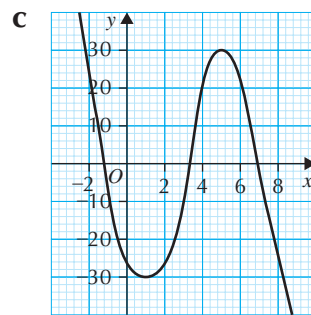
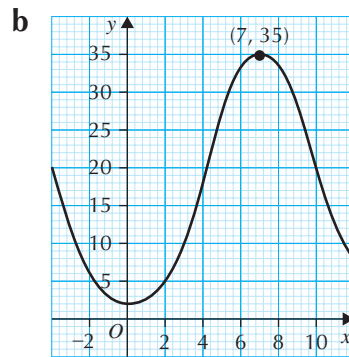
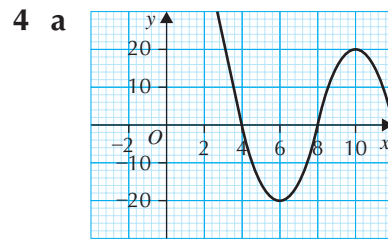
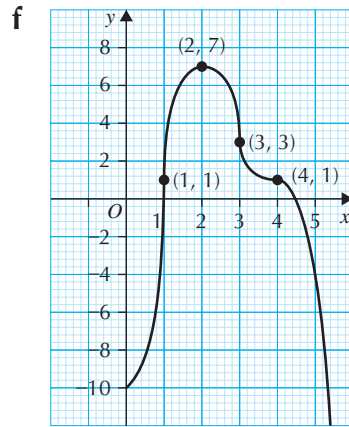
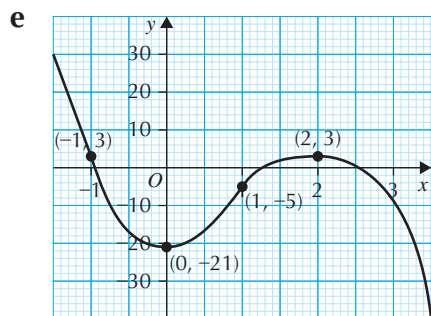
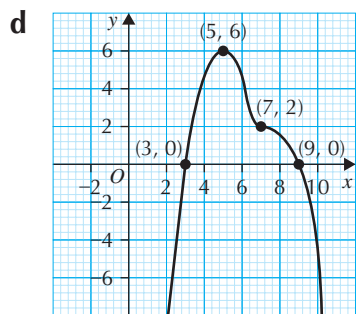
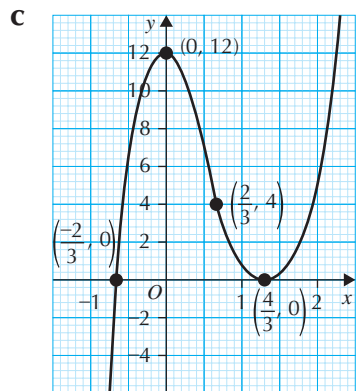
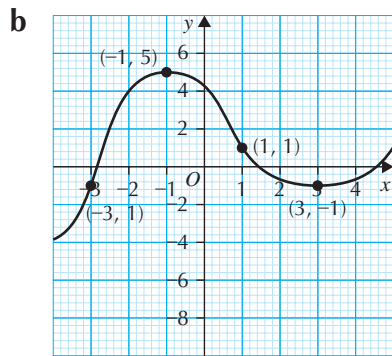
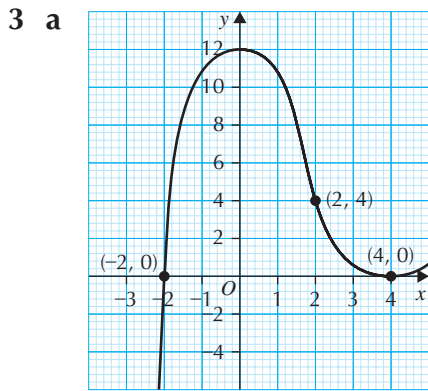


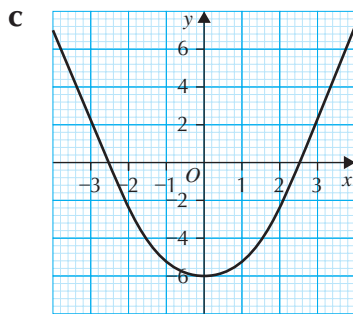
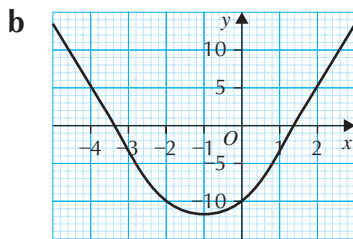
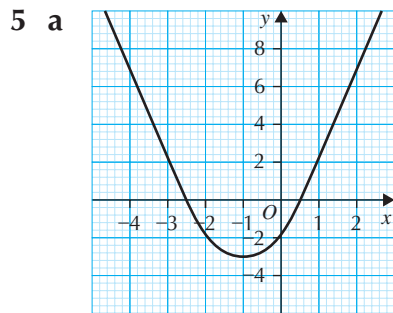
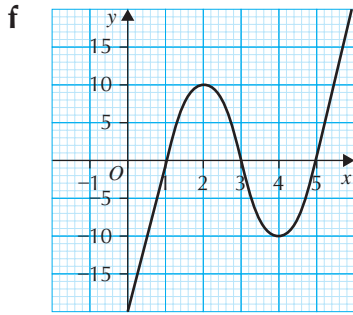
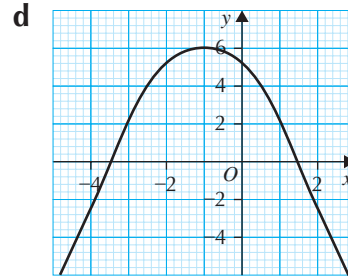
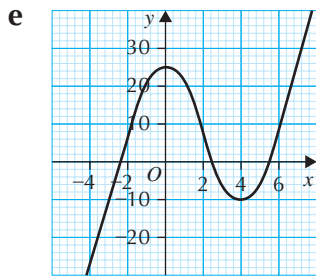
b



c







Exercise 3B

- 1 a** $(x + 2)^2 - 4$
b $(x - 3)^2 + 1$
c $(x + 4)^2 - 17$
d $(x + 1)^2 + 4$
e $14 - (x - 2)^2$
f $16 - (x + 3)^2$
g $6 - (x - 3)^2$
h $\frac{49}{4} - (x + \frac{3}{2})^2$
- 2 a** $2(x + 2)^2 - 5$
b $2(x - 1)^2 + 13$
c $3(x + 2)^2 - 17$
d $5(x - 3)^2 - 9$
e $4(x - \frac{3}{2})^2 - 8$
f $2(x + \frac{3}{2})^2 - \frac{27}{2}$
g $3(x + \frac{5}{2})^2 - \frac{47}{4}$
h $4(x + \frac{7}{2})^2 - 42$
- 3 a** $17 - 2(x + 1)^2$
b $36 - (x - 6)^2$
c $7 - 4(x - 1)^2$
d $4 - 3(x - 2)^2$
e $\frac{11}{2} - 2(x - \frac{3}{2})^2$
f $44 - 4(x + \frac{5}{2})^2$
g $\frac{23}{4} - 7(x - \frac{1}{2})^2$
h $\frac{3}{2} - 2(x + \frac{3}{2})^2$

4 a $\frac{49}{8} - 2\left(x - \frac{1}{4}\right)^2$

b $6\left(x + \frac{7}{12}\right)^2 - \frac{1}{24}$

c $3(x + 1)^2 - 8$

d $(x + 2)^2 + 10$

5 Completing the Square gives:

$$a\left(x + \frac{b}{2a}\right)^2 + c - \frac{b^2}{4a}$$

$$4a^2\left(x + \frac{b}{2a}\right)^2 = b^2 - 4ac$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Exercise 3C

1 a (3, 2), min

b (-3, -7), min

c (-4, 12), max

d (5, 3), min

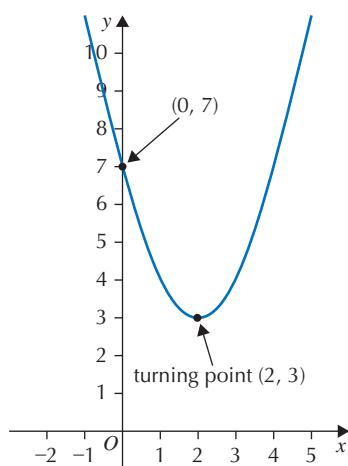
e (5, 5), max

f (-5, 7), max

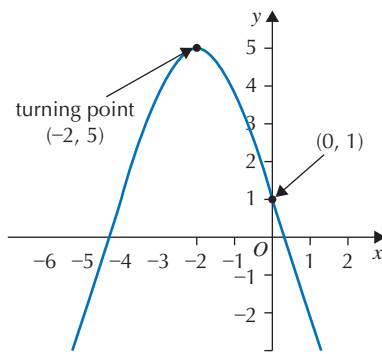
g (2, 9), min

h (-7, 13) max

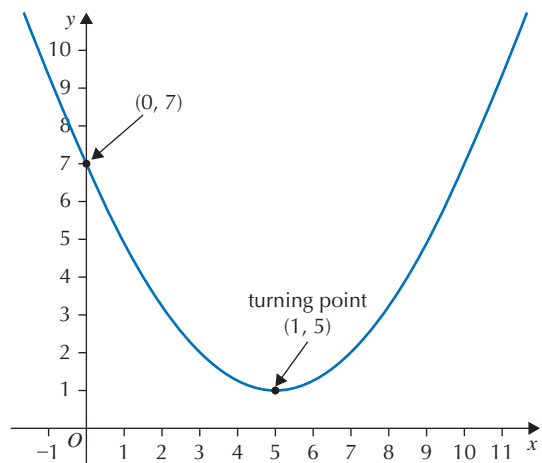
2 a



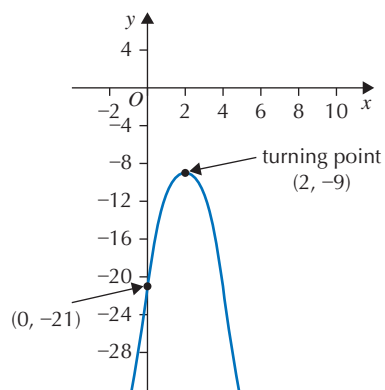
b



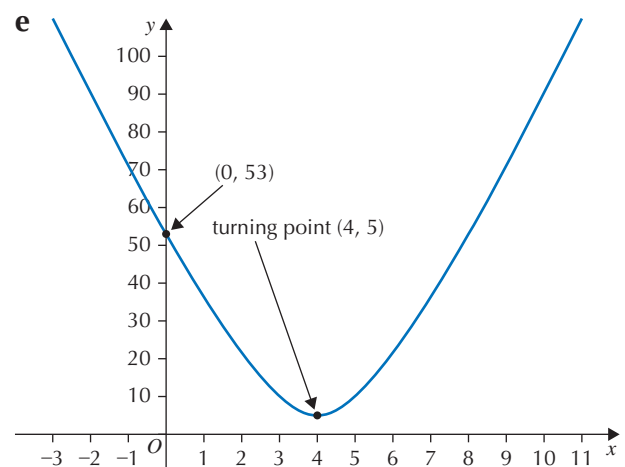
c

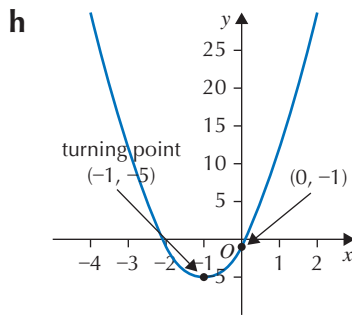
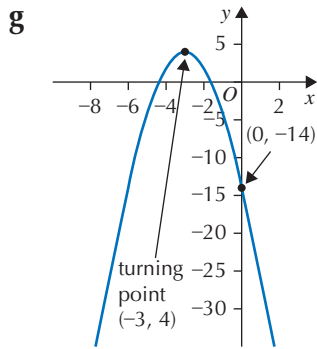
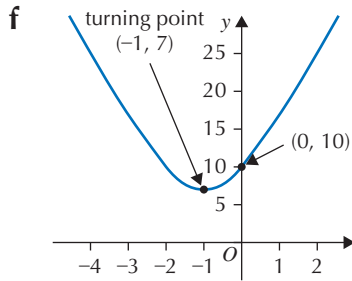


d

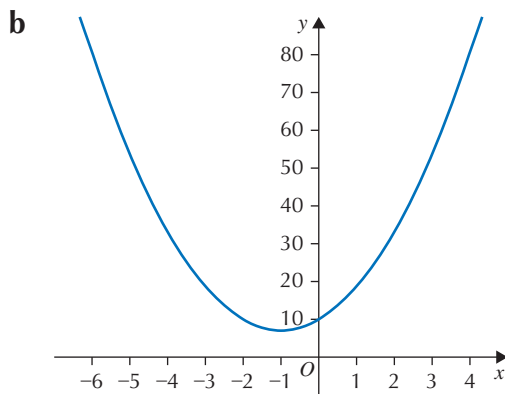


e

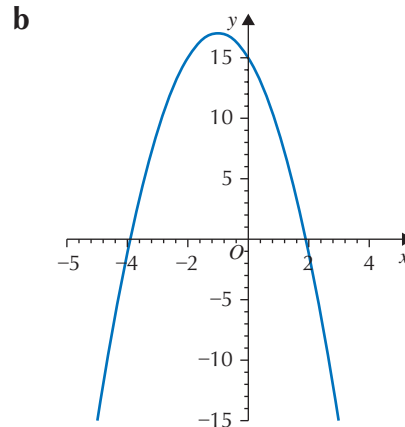




3 a $3(x+1)^2 + 7$



4 a $17 - 2(x+1)^2$



5 a $y = (x-2)^2 + 1$

b $y = 27 - 2(x-3)^2$

c $y = 3(x+5)^2 + 1$

d $y = 3(x-2)^2 + 5$

e $y = -2(x-3)^2 - 1$

f $y = 9 - 2(x-2)^2$

6 a $y = 3(x+1)^2 - 5$

b $(-1, -5)$

7 a $y = \frac{29}{4} - (x - \frac{3}{2})^2$

b $(\frac{3}{2}, \frac{29}{4})$

8 a $y = 3(x+2)^2 + 42$

b $(-2, 42)$

9 a $y = 4(x - \frac{1}{2})^2 - 16$

b $(\frac{1}{2}, 16)$

10 $(x+2)^2 + 5$ has minimum value of 5

11 $16 - (x+1)^2$ is never greater than 16

12 $2(x + \frac{3}{2})^2 + \frac{13}{2}$ is never less than $\frac{13}{2}$

13 $p(x + \frac{q}{2p})^2 + r - \frac{q^2}{4p}$

turning point is at

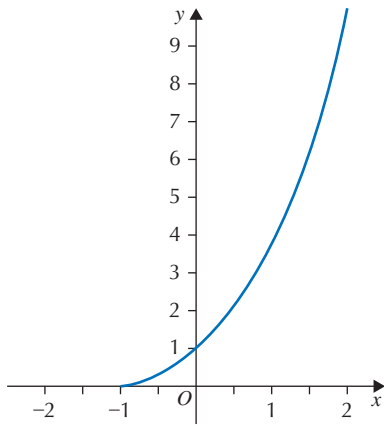
$x = -\frac{q}{2p}$

$y = r - \frac{q^2}{4p}$

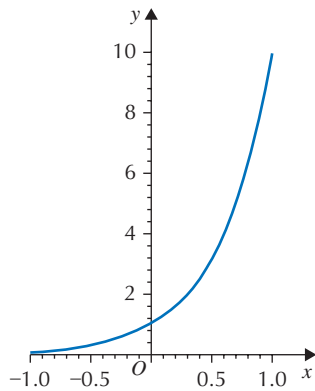
Exercise 3D

1 a -> h see appropriate graph;

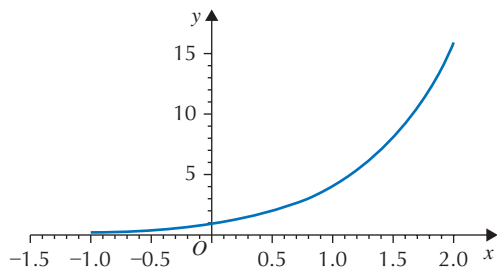
a



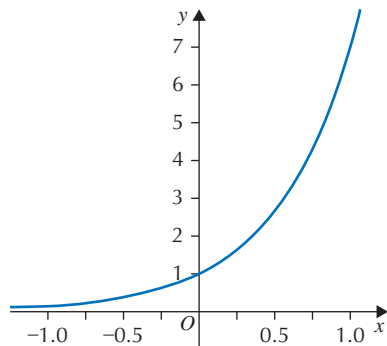
b



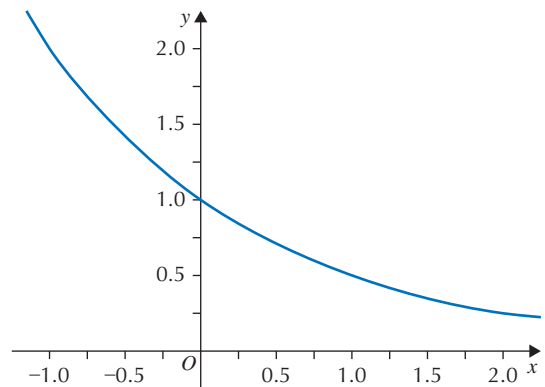
c



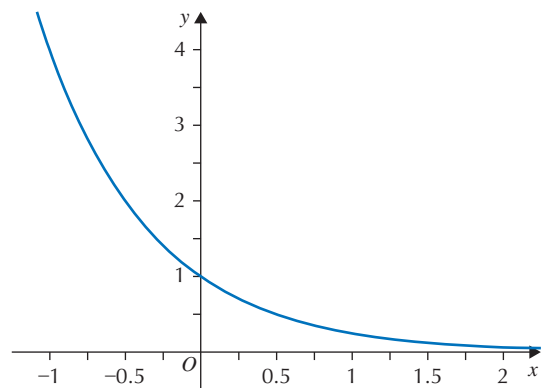
d



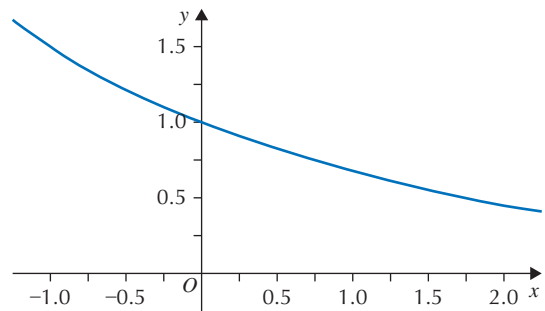
e



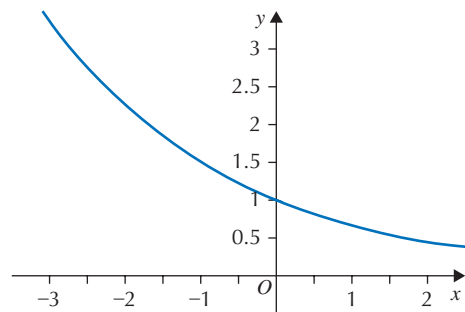
f



g



h

2 $y = a^x$; values of a follow:

a 6

b 3

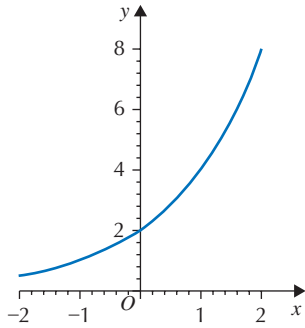
c 4

d 2

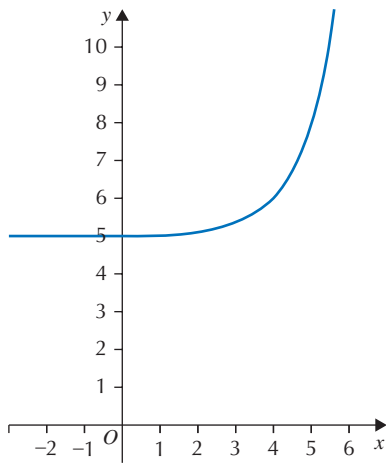
e $\frac{1}{2}$ f $\frac{1}{3}$

3 a -> h see appropriate graph;

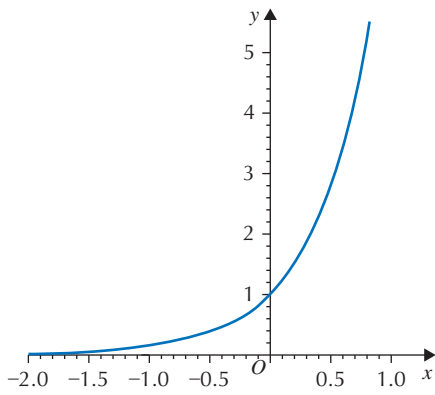
a



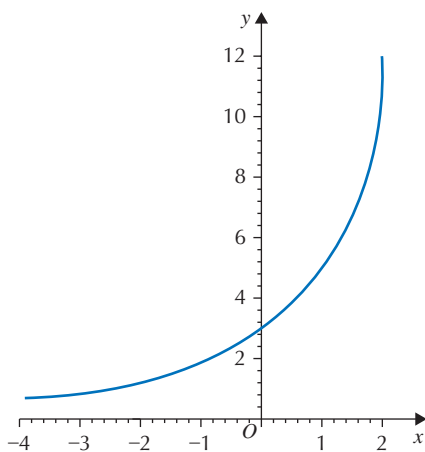
b



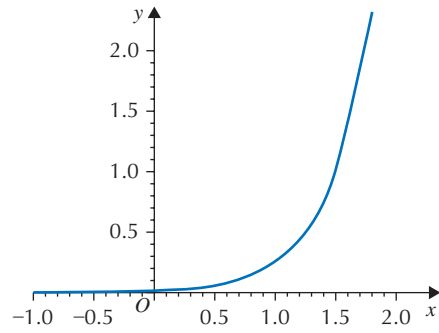
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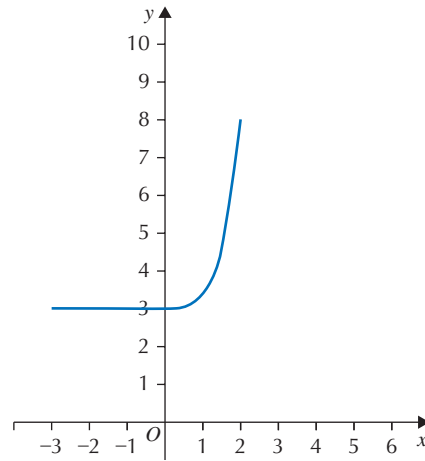
d



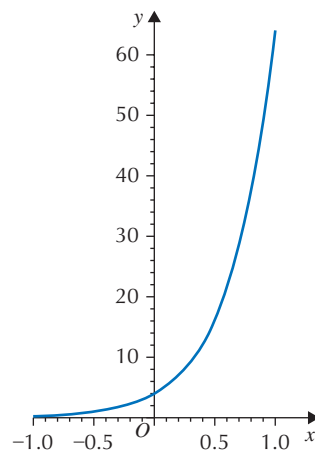
e



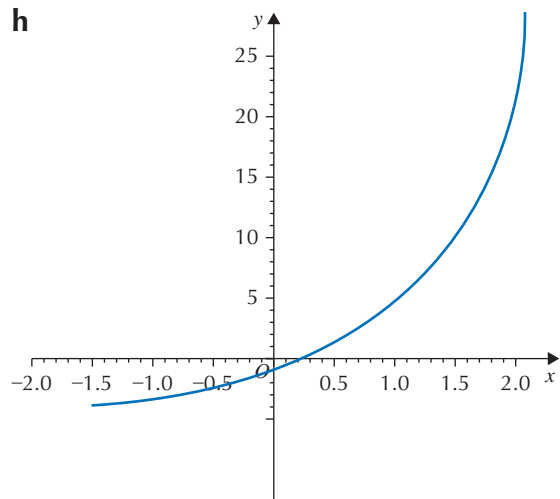
f



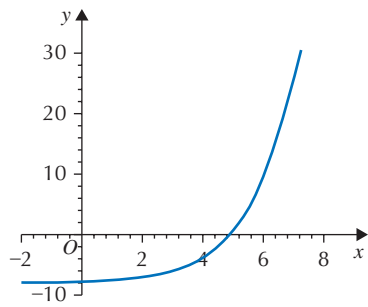
g



h

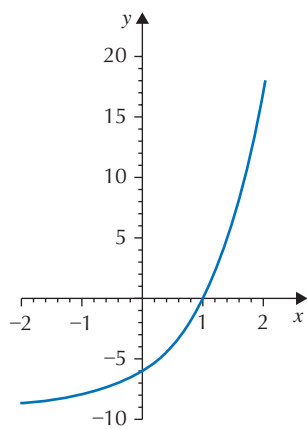


4 See plot



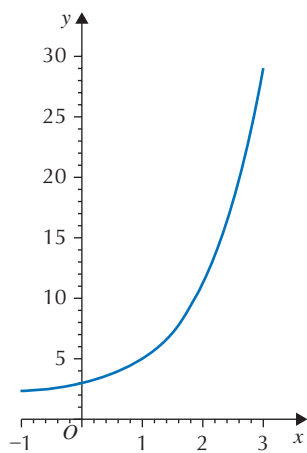
Cuts x axis at $x = 5$

5 See plot



Cuts x axis at $x = 1$

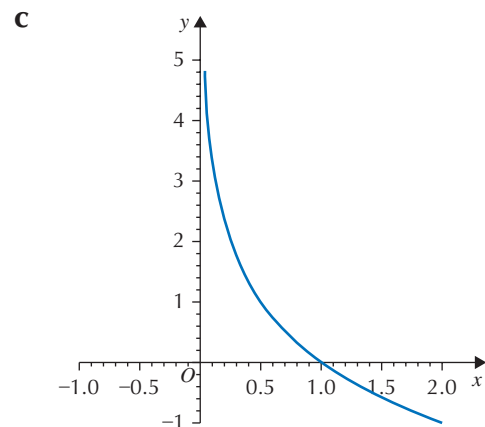
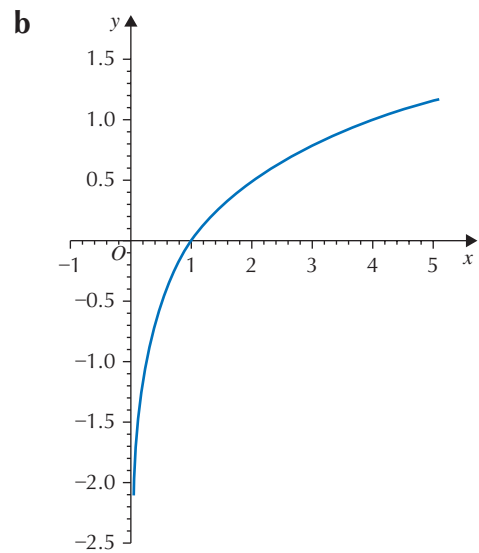
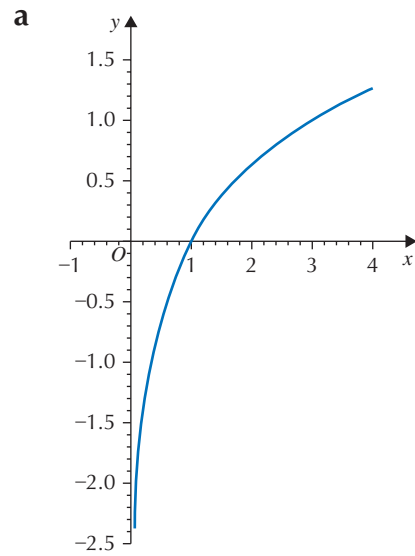
6 See plot

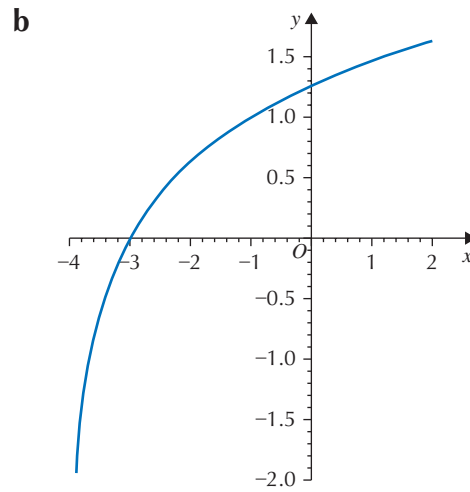
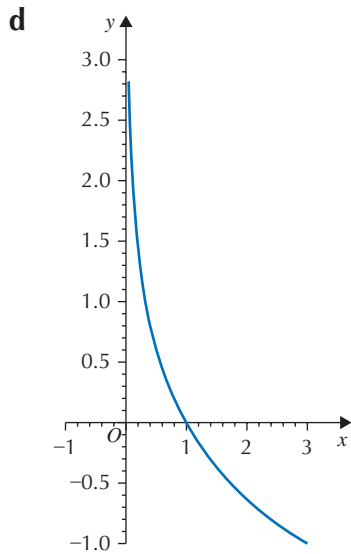


$y = 3^x + 2$ so $a = 3$, $b = 2$.

Exercise 3E

1 For a \rightarrow d see graph





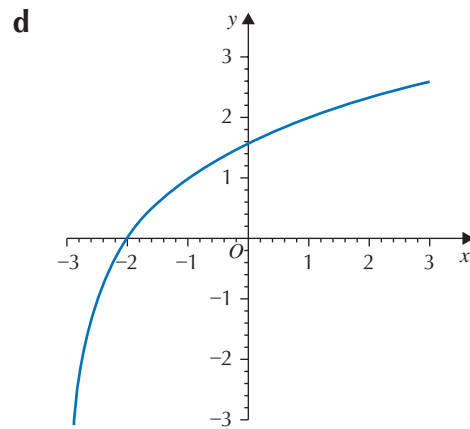
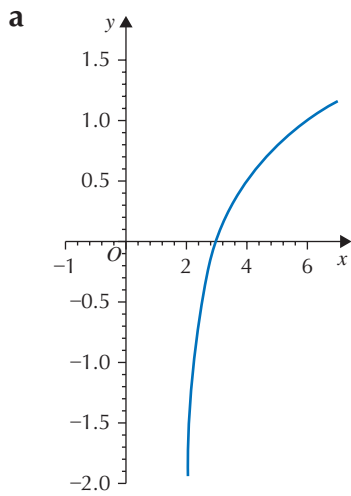
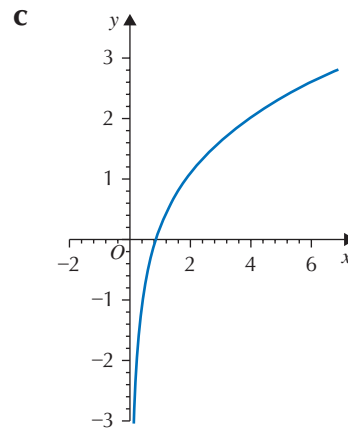
2 a $y = \log_6 x$

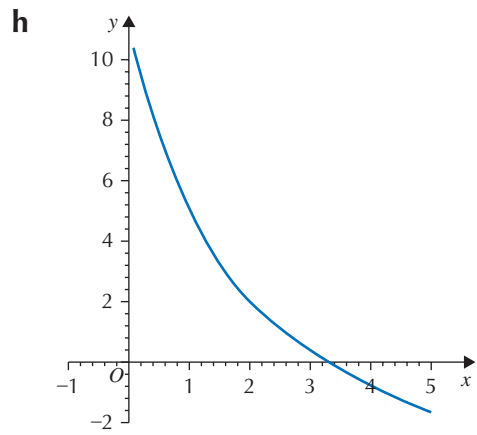
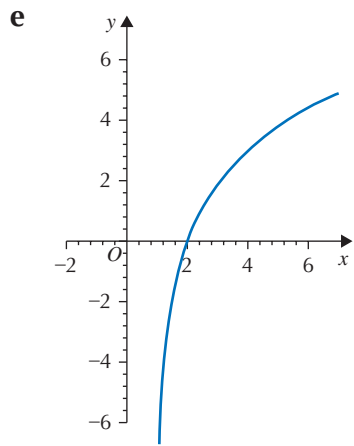
b $y = \log_{10} x$

c $y = \log_{3/4} x$

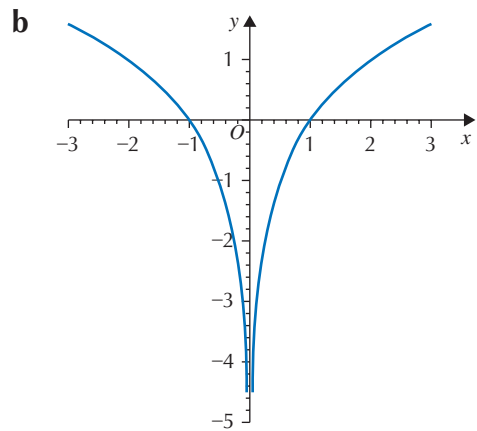
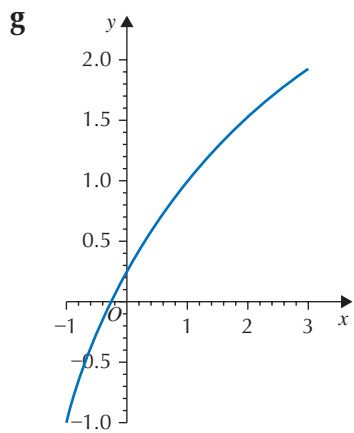
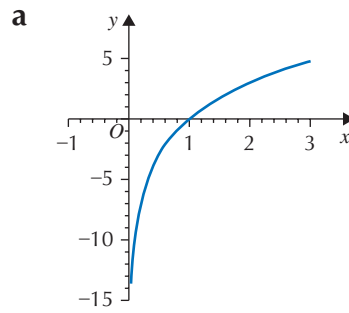
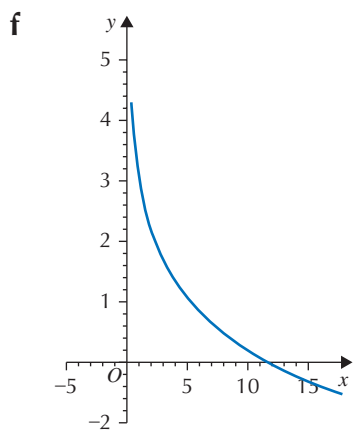
d $y = \log_{1/5} x$

3 For a \rightarrow h see appropriate graph;

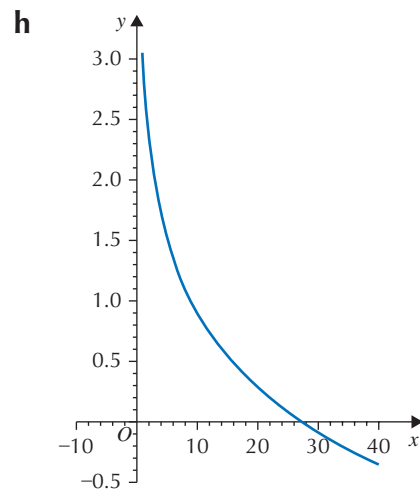
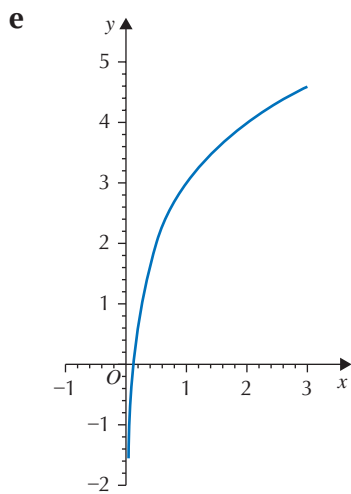
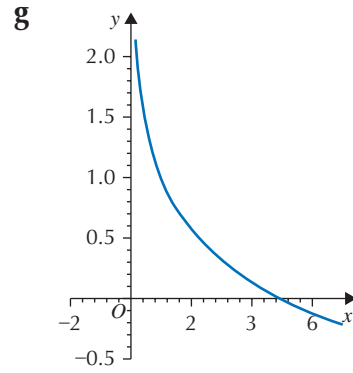
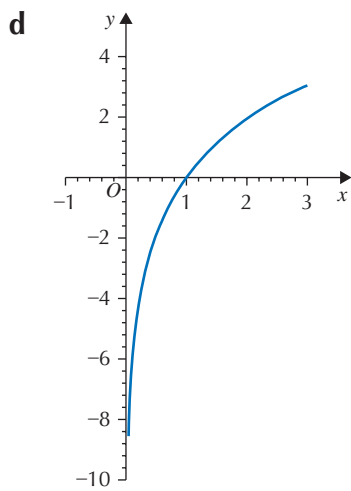
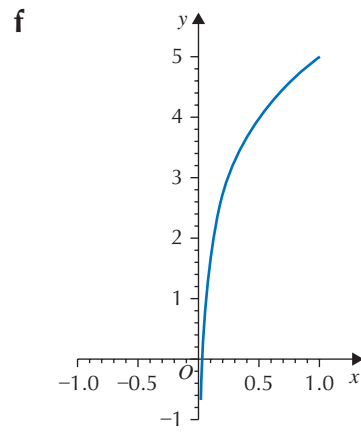
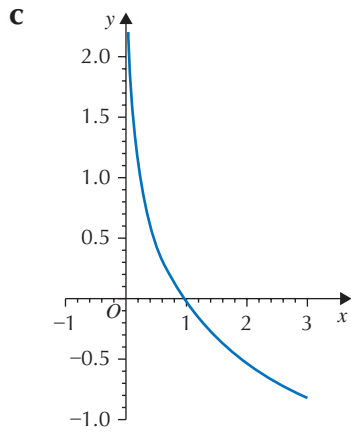




4 For **a** -> **h** see appropriate graph;

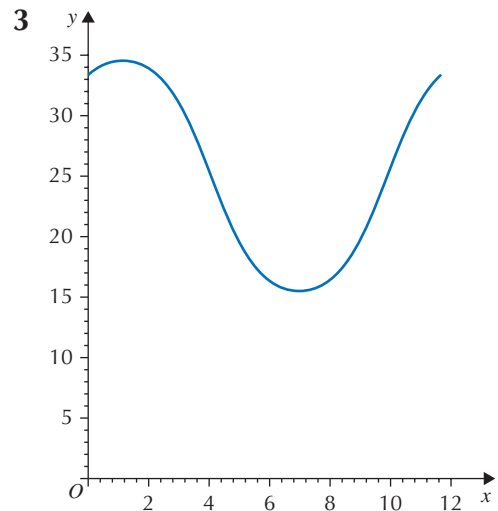
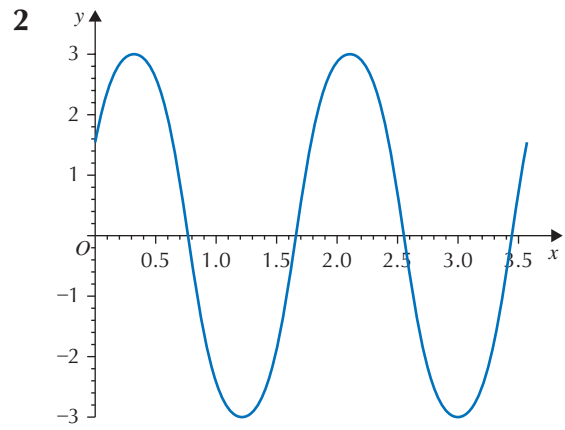
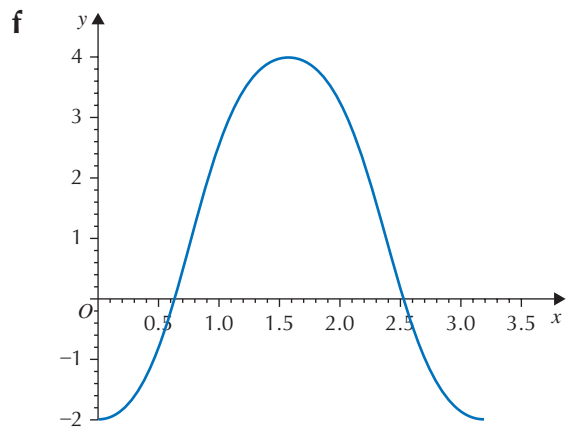
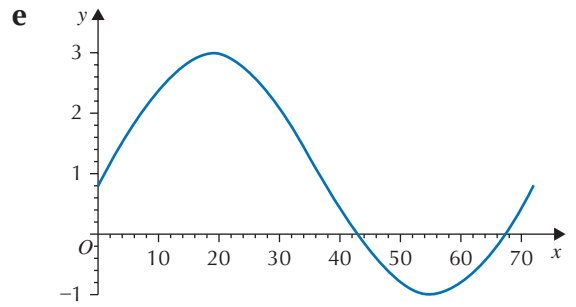
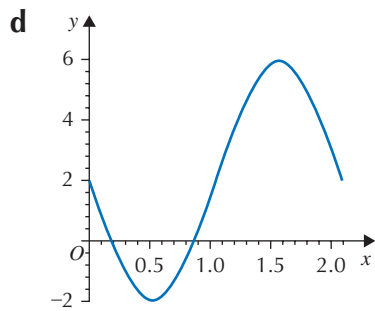
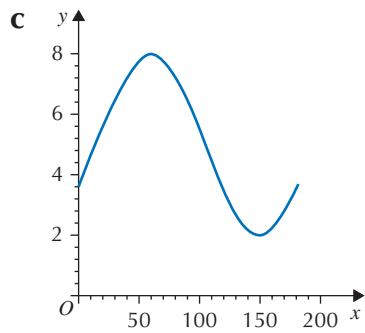
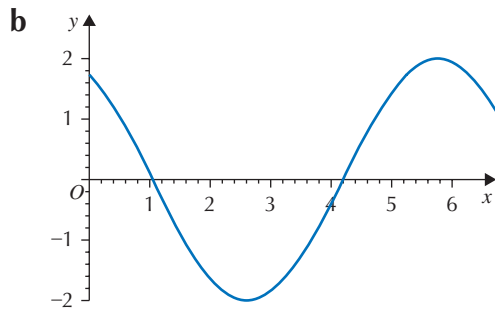
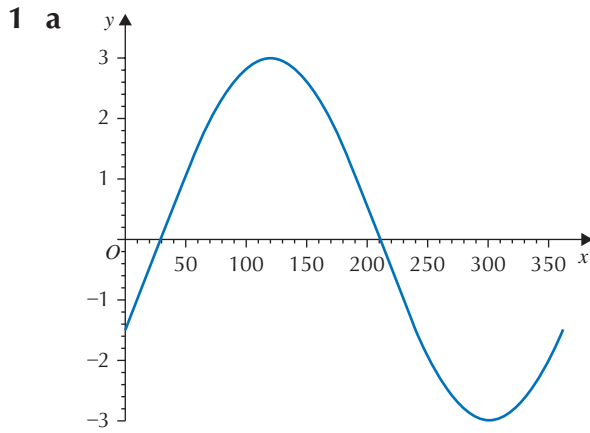


● ANSWERS



5 $a = 4$
 $b = 4$

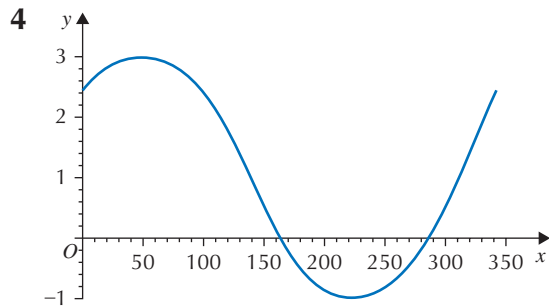
Exercise 3F



34.5 max at $t = 1 \Rightarrow$ January

15.5 min at $t = 7 \Rightarrow$ July

● ANSWERS



$A = 2, b = 45, c = -1$

5 $p = 4, q = 30, r = -1$

6 $a = 2.2, b = -30, c = 3.6$

7 a max (48, 4); min (228, -2)

b max (120, 27); min (300, 13)

c max($\frac{\pi}{4}, 25$); min($\frac{5\pi}{4}, -15$)

d max($\frac{5\pi}{6}, 35$); min($\frac{11\pi}{6}, -25$)

e max(126, 11); min(36, -3)

f max(30, 6); min(12, -2)

g max(11, 60); min(5, -40)

h max($\frac{\pi}{24}, 4$); min($\frac{\pi}{8}, -6$)

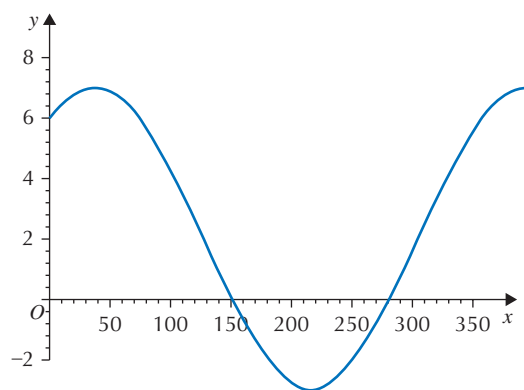
8 40cm at 8am

9 a max = 120; min = 80

b 80 bpm

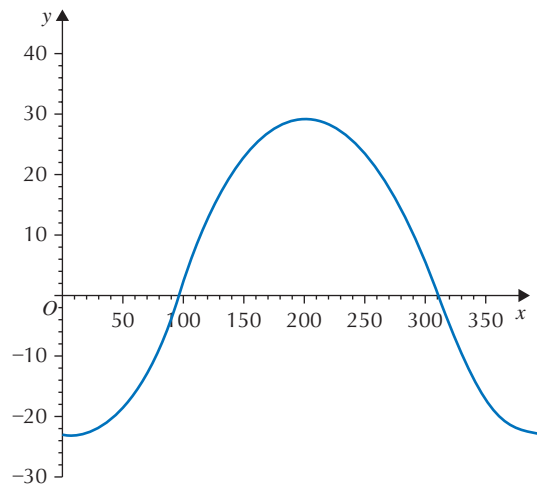
10a $5\cos(x - 36.87)$

b Max(36.87, 7); Min(216.87, 3)



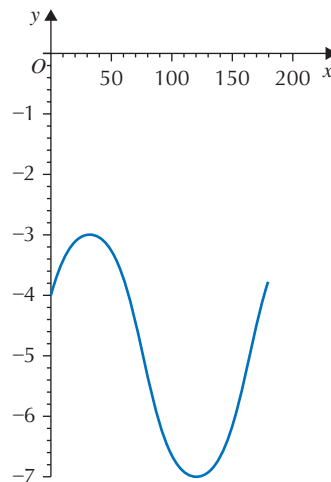
11a $13\sin(x + 67.38)$

b



c Min (22.62, -23); Max (202.62, 29)

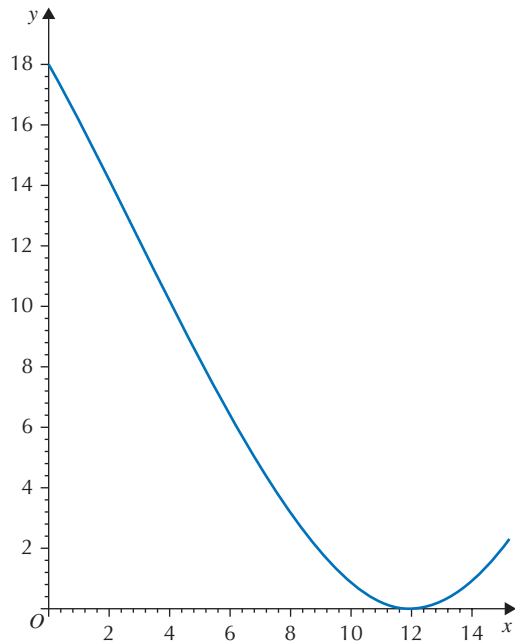
12a $2\sin(2x + 30)$



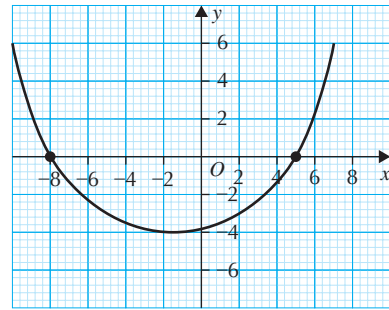
b Max(30, 1); Min(120, -11)

13 a $5\sin(12x - 53.13)$

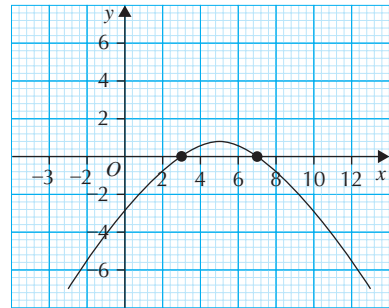
b



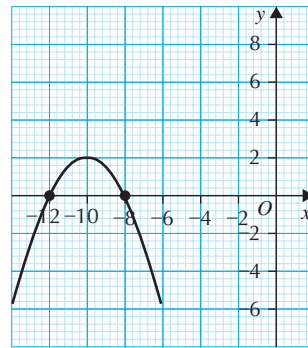
c



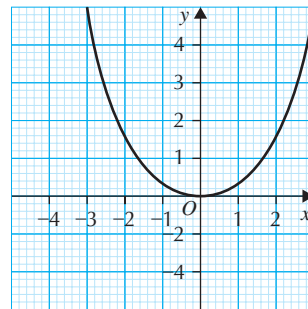
d



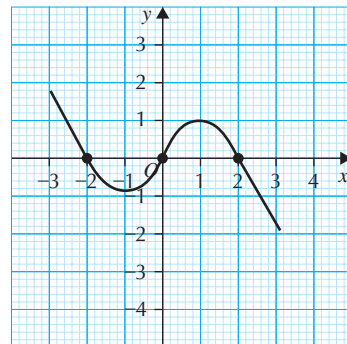
e



f

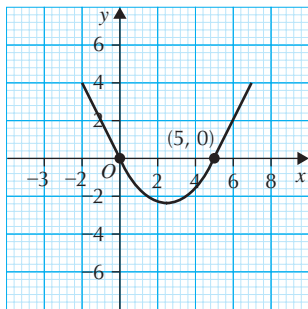


2 a

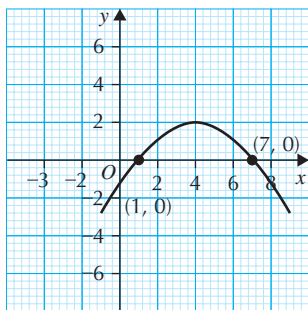


Exercise 3G

1 a



b



● ANSWERS

