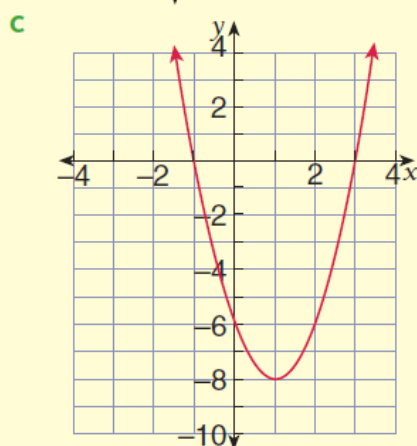
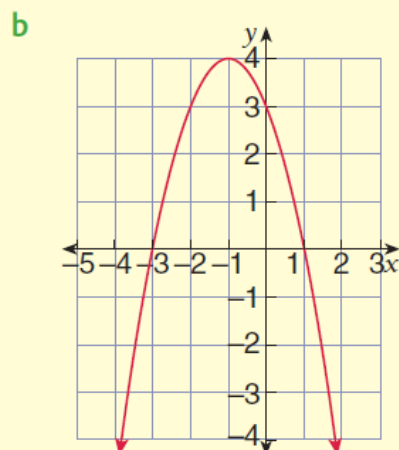
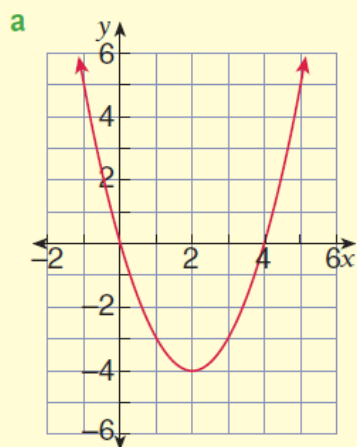


Quadratic functions

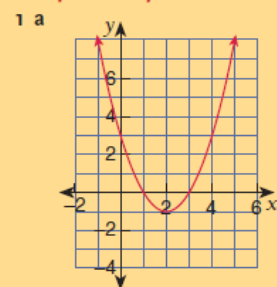
Exercise 4:02

- 1** For each of the graphs, find:
- i the y-intercept
 - ii the x-intercepts
 - iii the equation of the axis of symmetry
 - iv the coordinates of the vertex



Foundation Worksheet 4:02

The parabola $y = ax^2 + bx + c$



Use the graph to find:

- i the y-intercept
 - ii the x-intercepts
 - iii the equation of the axis of symmetry
 - iv the coordinates of the vertex
- 2 a** For the parabola $y = x^2 + x + 2$, find:
- i the y-intercept
 - ii the x-intercepts
 - iii the equation of the axis of symmetry
 - iv the coordinates of the vertex

- 2** Find the y-intercepts of the following parabolas.

a $y = x^2 - 6x + 5$

b $y = 2x^2 - 8$

c $y = (x - 2)(x + 3)$

- 3** Find the x-intercepts of the following parabolas.

a $y = x^2 - 2x - 8$

b $y = 3x^2 + 10x - 8$

c $y = (x - 3)(4x + 7)$

- 4** Find the equation of the axis of symmetry and the coordinates of the vertex of the following parabolas.

a $y = (x - 3)(x - 5)$

b $y = 3(x - 2)(x + 6)$

c $y = -\frac{1}{2}(x + 4)(2 - x)$

d $y = x^2 - 6x + 7$

e $y = 3x^2 - 9x + 14$

f $y = 4 - 3x - x^2$

- 5** Find the minimum value of y on the following parabolas.

a $y = x^2 - 6x - 2$

b $y = 4x^2 - 4x + 6$

c $y = 9x^2 - 30x + 18$

- 6** Find the maximum value of y on the following parabolas.

a $y = 1 - 2x - x^2$

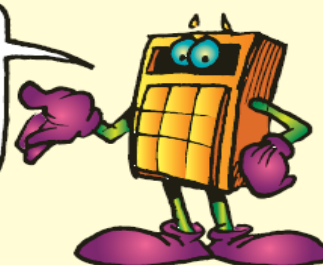
b $y = -4x^2 + 20x - 27$

c $y = 7 - 12x - 9x^2$

7 For the parabola $y = x^2 + 2x - 8$, find:

- a the y-intercept
- b the x-intercepts
- c the axis of symmetry
- d the vertex
- e hence, sketch its graph

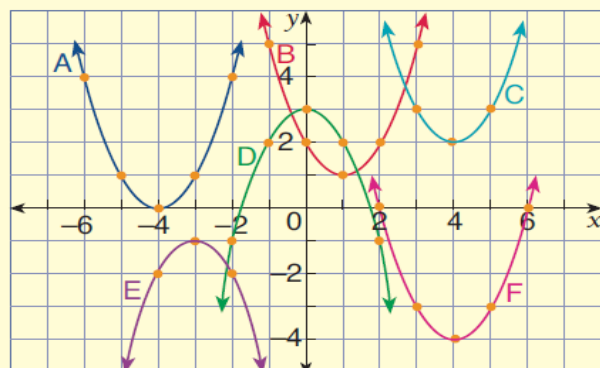
When finding the x-intercepts, if you can't factorise, then use the formula.



8 Repeat the steps in question 7 to graph the following equations, showing all the relevant features.

- | | |
|------------------------|-----------------------|
| a $y = x^2 - 6x + 5$ | b $y = x^2 - 6x$ |
| c $y = 2x^2 - 8x - 10$ | d $y = -x^2 + 4x - 3$ |
| e $y = -x^2 + 6x - 9$ | f $y = 2x^2 + 4x + 2$ |
| g $y = x^2 - 3x - 4$ | h $y = 2x^2 - 3x - 2$ |
| i $y = -2x^2 - 3x - 1$ | |

9 Match each graph with one of the equations written below the diagram. Each graph has an x^2 shape.



- | | |
|------------------------|-----------------------|
| a $y = -x^2 + 3$ | b $y = x^2 - 2x + 2$ |
| c $y = x^2 - 8x + 12$ | d $y = x^2 + 8x + 16$ |
| e $y = -x^2 - 6x - 10$ | f $y = x^2 - 8x + 18$ |

- 1 Find the turning point.
- 2 Is it happy \uparrow (a is +ve) or sad \downarrow (a is -ve)?
- 3 Visualise the graph before you sketch.



10 Sketch each set of three parabolas on the same number plane.

- | | | |
|--------------------------|--------------------------|--------------------------|
| a i $y = x^2 - 4$ | ii $y = x^2 - 4x$ | iii $y = x^2 - 4x + 4$ |
| b i $y = 9 - x^2$ | ii $y = 9x - x^2$ | iii $y = 10 + 9x - x^2$ |
| c i $y = (x - 3)(x + 5)$ | ii $y = 2(x - 3)(x + 5)$ | iii $y = (3 - x)(5 + x)$ |
| d i $y = x^2 - 2x - 8$ | ii $y = 2x^2 - 4x - 16$ | iii $y = 8 + 2x - x^2$ |

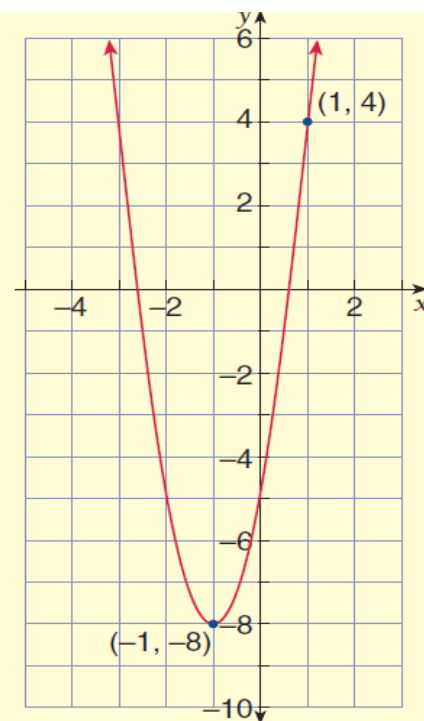
11 Sketch the graph of each quadratic relationship, showing all relevant features.

- | | | |
|------------------------|-------------------------|------------------------|
| a $y = 2x^2 - 8$ | b $y = 16 - x^2$ | c $y = (x + 2)(x - 6)$ |
| d $y = x^2 + 4x + 3$ | e $y = x^2 - 8x + 7$ | f $y = x^2 - 5x$ |
| g $y = (3 - x)(7 + x)$ | h $y = 24 - 2x - x^2$ | i $y = 4x^2 + 16x + 7$ |
| j $y = 2x^2 + 9x - 5$ | k $y = 4x^2 - 36x + 56$ | l $y = 2x^2 - 5x - 7$ |

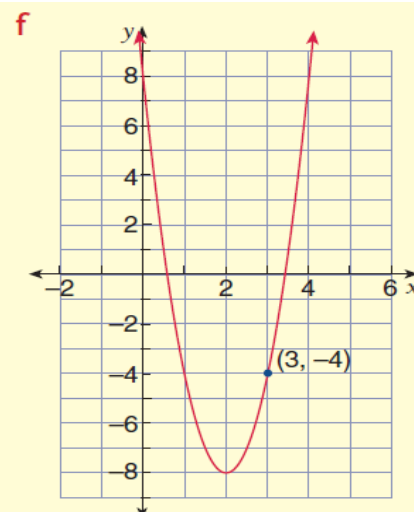
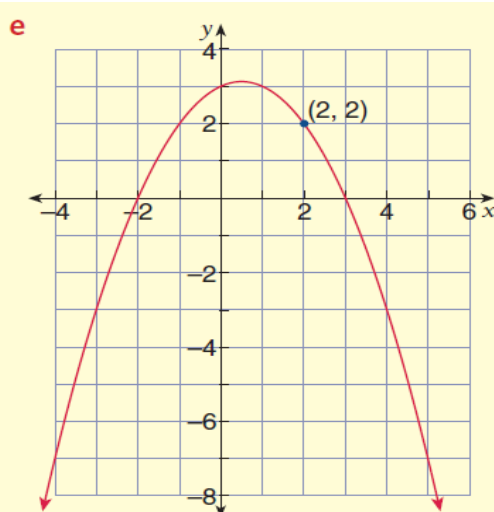
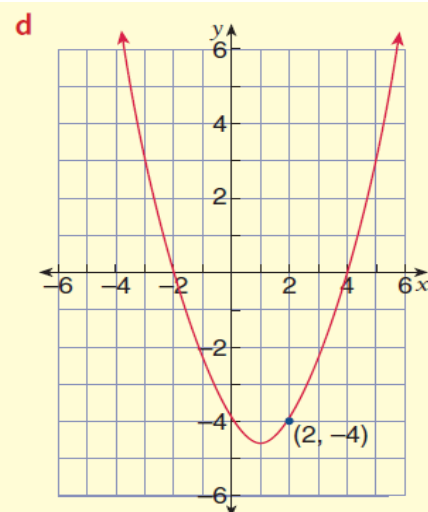
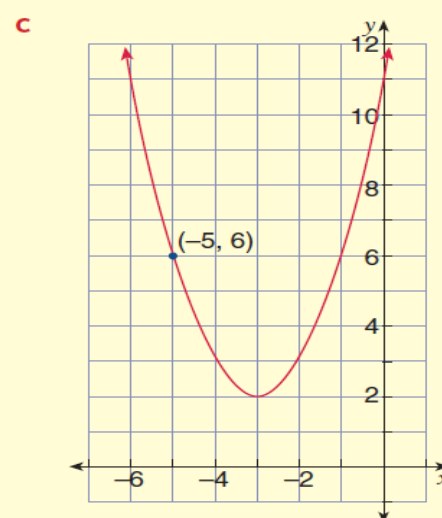
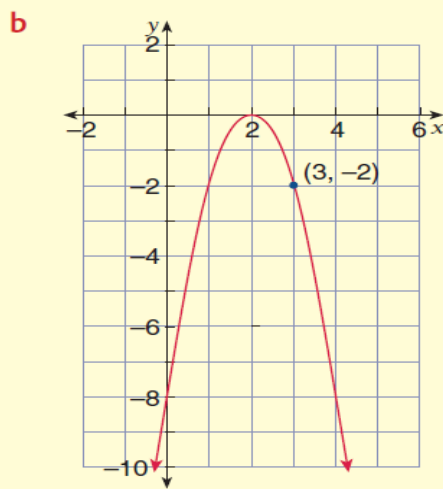
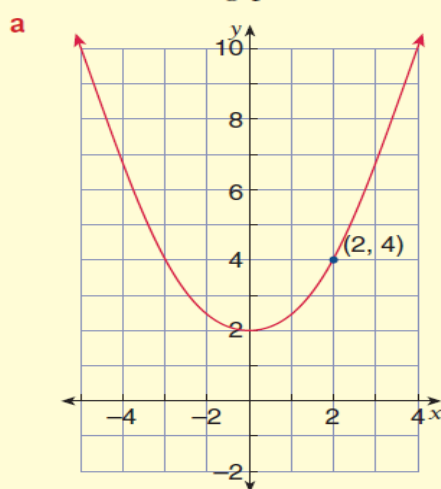
- 12** a Sketch the graphs of $y = x^2 + 3x$ and $y = 2x^2 + 6x$. Compare the two graphs and describe the difference between them.
- b Sketch the graphs of $y = (x - 3)(x + 2)$ and $y = 3(x - 3)(x + 2)$. Compare the two graphs and describe the difference between them.

- 13** The parabola in the diagram has its vertex at $(-1, -8)$ and it passes through the point $(1, 4)$. The equation of the parabola has the form $y = ax^2 + bx + c$.

- a** Use the y -intercept to show that $c = -5$.
- b** Use the equation of the axis of symmetry to show that $b = 2a$ and that the equation of the parabola is of the form $y = ax^2 + 2ax - 5$.
- c** Substitute the coordinates of the vertex or the point $(1, 4)$ to find the value of a .
- d** What is the equation of the parabola?



- 14** Use the method of question 13 to find the equation of each of the following parabolas.



Answers:

Exercise 4:02

- 1 a i 0 ii 0, 4 iii $x = 2$ iv (2, -4)
 b i 3 ii -3, 1 iii $x = -1$ iv (-1, 4)
 c i -6 ii -1, 3 iii $x = 1$ iv (1, -8)

- 2 a 5 b -8 c -6

- 4 a $x = 4$, (4, -1) b $x = -2$, (-2, -48)

- d $x = 3$, (3, -2) e $x = 1\frac{1}{2}$, ($1\frac{1}{2}$, $7\frac{1}{4}$)

- 5 a -11 b 5 c -7

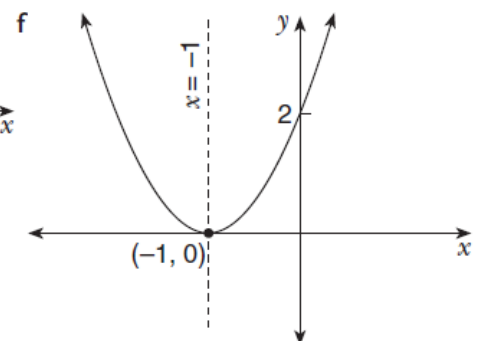
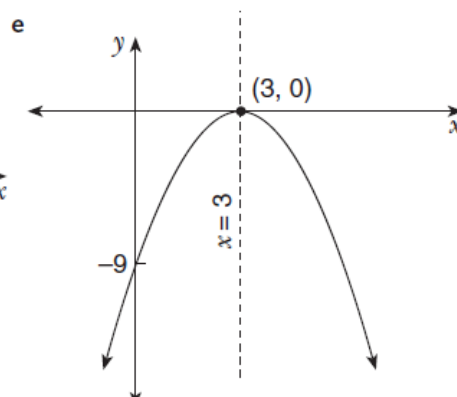
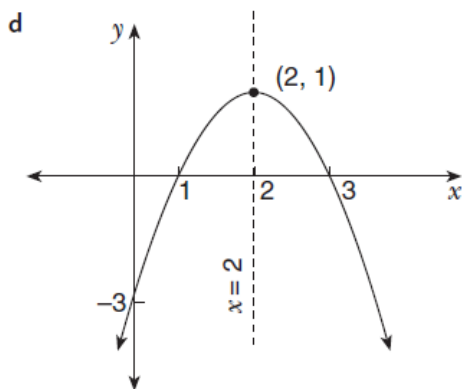
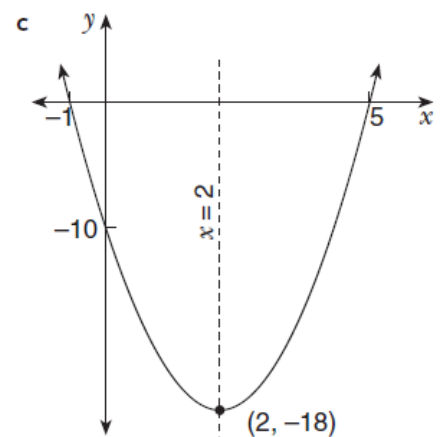
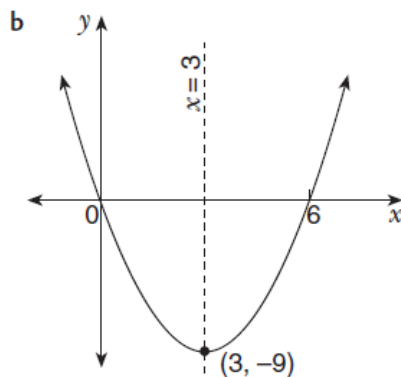
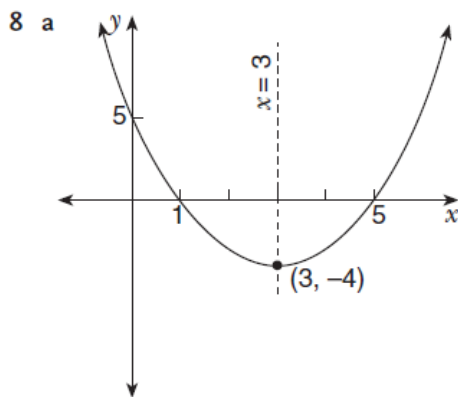
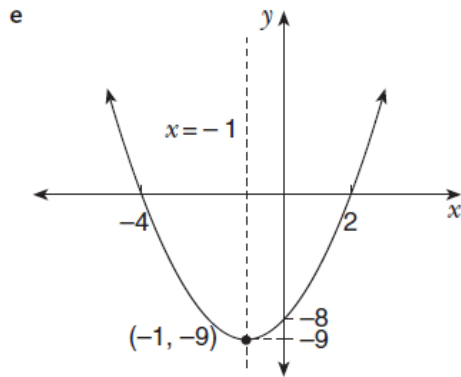
- 3 a -2, 4 b $-4, \frac{2}{3}$ c $-\frac{7}{4}, 3$

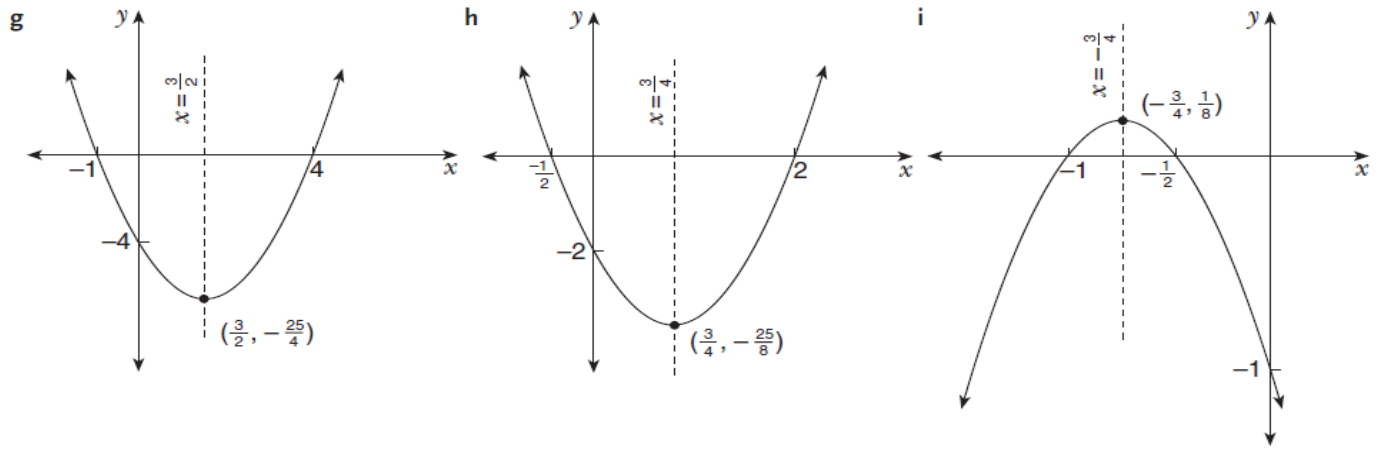
- c $x = -1$, ($-1, -\frac{9}{2}$)

- f $x = -1\frac{1}{2}$, ($-1\frac{1}{2}$, $6\frac{1}{4}$)

- 6 a 2 b -2 c 11

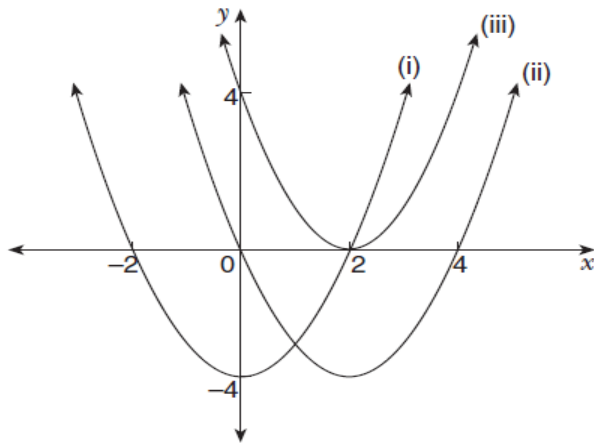
- 7 a (0, -8)
 b (-4, 0), (2, 0)
 c $x = -1$
 d (-1, -9)



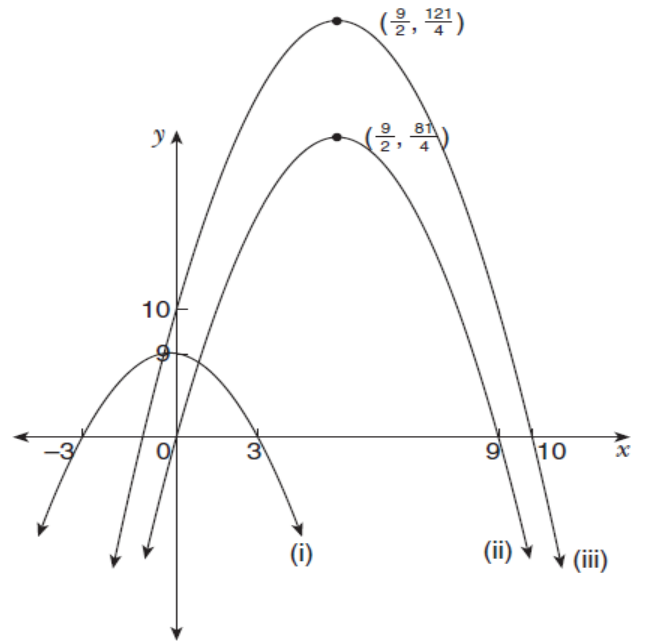


g a D b B c F d A e E f C

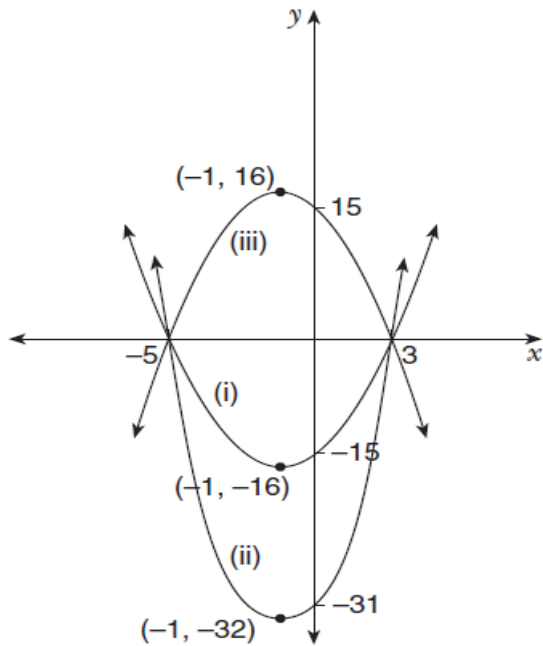
10 a



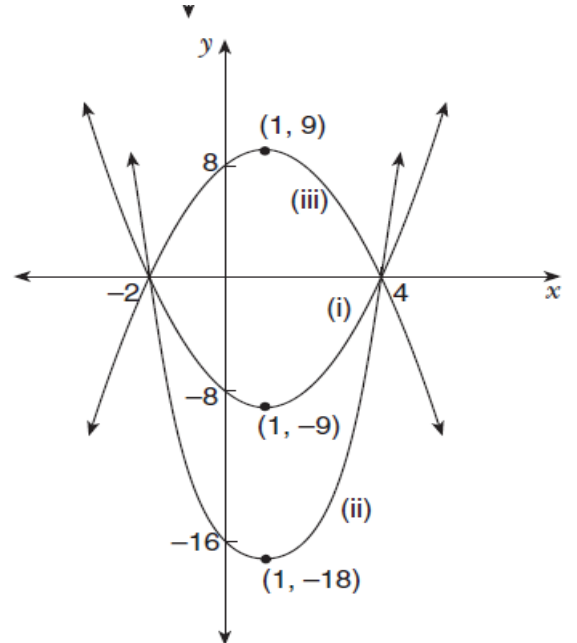
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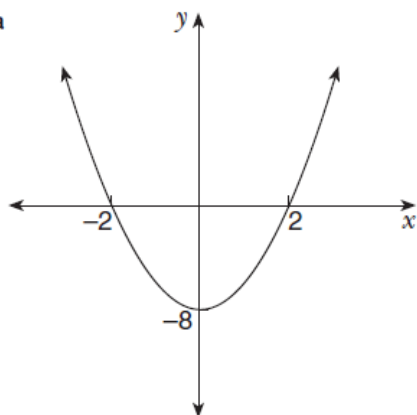
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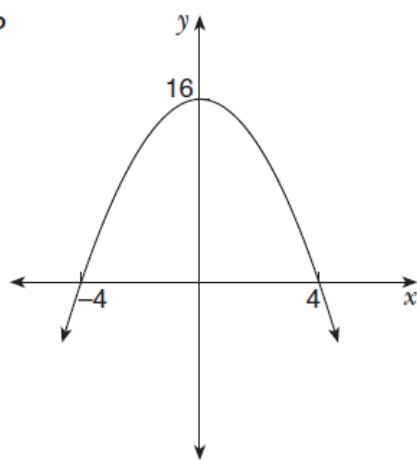
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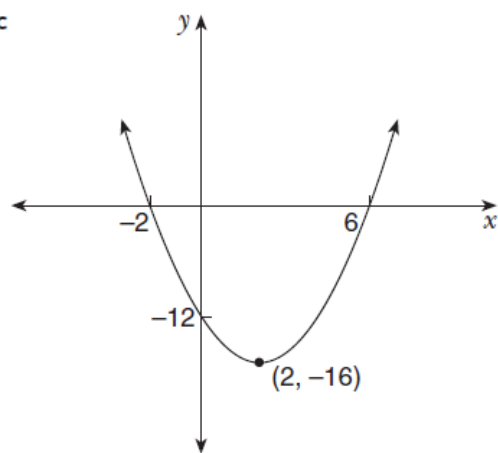
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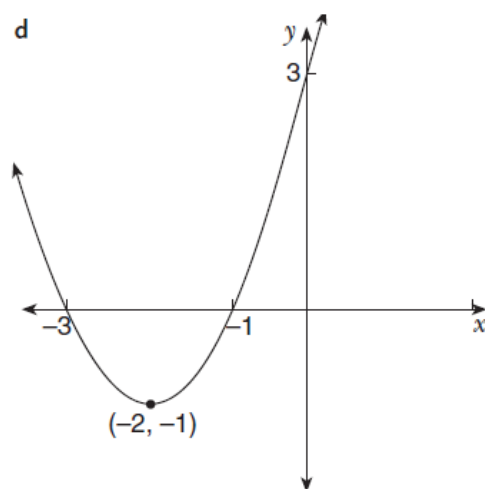
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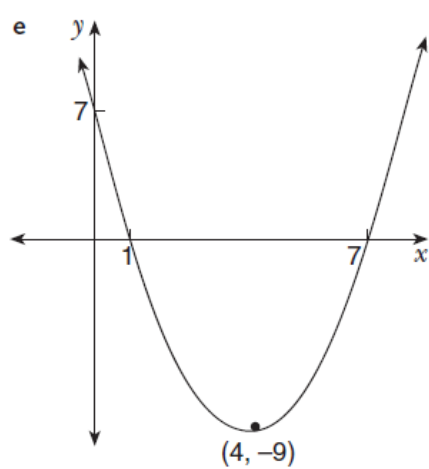
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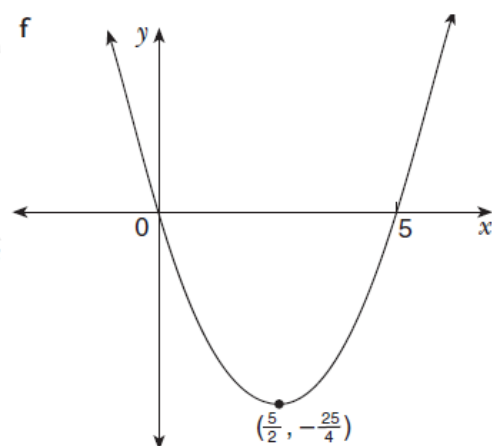
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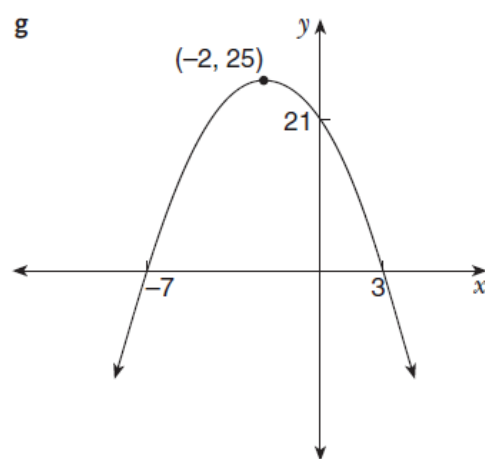
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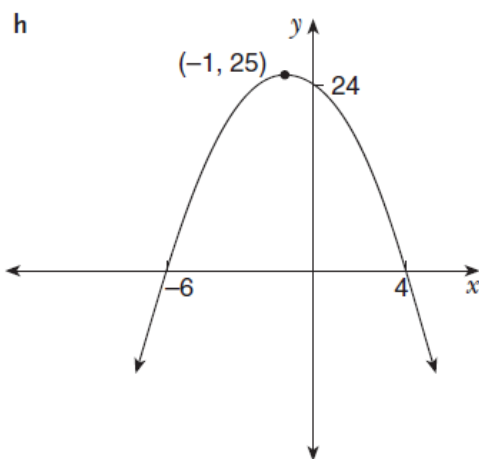
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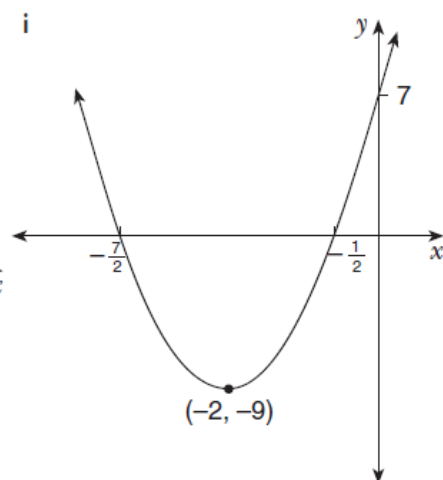
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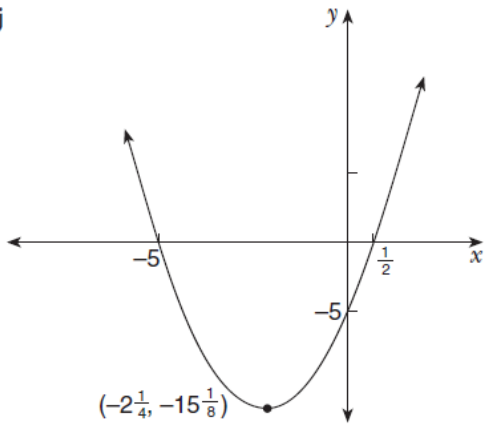
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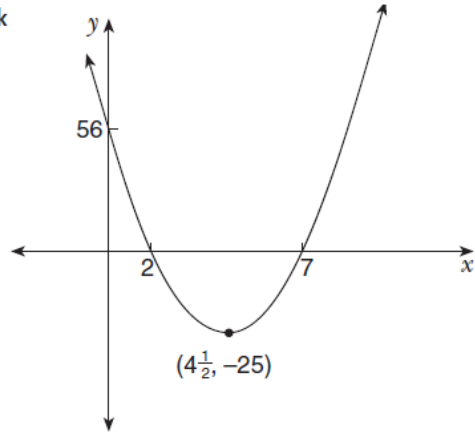
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