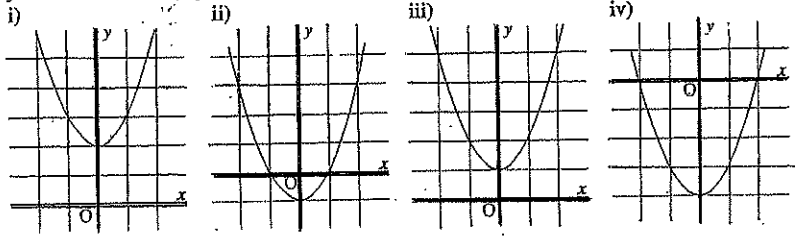
EXERCISES 6-2

(A)

1. a) Make a table of values and graph each parabola on the same grid for $-5 \leq x \leq 5$.
   $y = x^2$ $y = x^2 + 4$ $y = x^2 + 7$
   $y = x^2 - 2$ $y = x^2 - 5$ $y = x^2 + 1$
   b) Describe the effect of various values of q on the graph of $y = x^2 + q$.

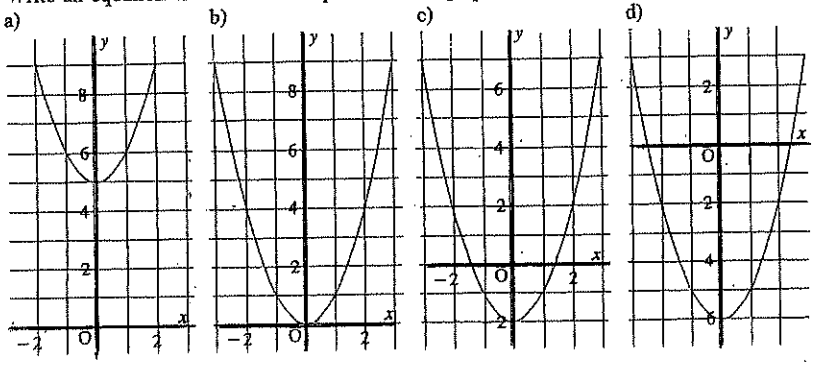
2. Which graph best represents each equation?
   a) $y = x^2 + 1$ b) $y = x^2 - 4$ c) $y = x^2 - 1$ d) $y = x^2 + 2$

i) ii) iii) iv)



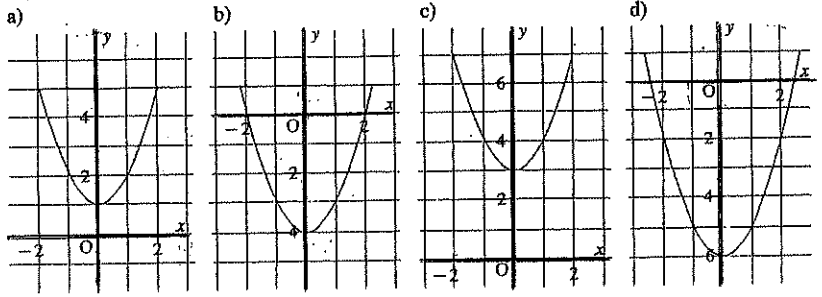
3. Write an equation that could correspond to each graph.

a) b) c) d)



4. For each parabola state:
   i) the direction of opening ii) the coordinates of the vertex
   iii) the y-intercept iv) the x-intercepts (if any).

a) b) c) d)



(B)

5. For each parabola state:
   i) the direction of opening ii) the coordinates of the vertex
   iii) the y-intercept iv) the x-intercepts (if any).
   a) $y = x^2 + 5$ b) $y = x^2 - 3$ c) $y = x^2 + 2$ d) $y = x^2 + 4$

6. Sketch each set of graphs on the same grid.
   a) $y = x^2 - 2$ $y = x^2 + 1$ $y = x^2 + 4$
   b) $y = x^2 - 1$ $y = x^2 - 3$ $y = x^2 + 2$

EXERCISES 6-3

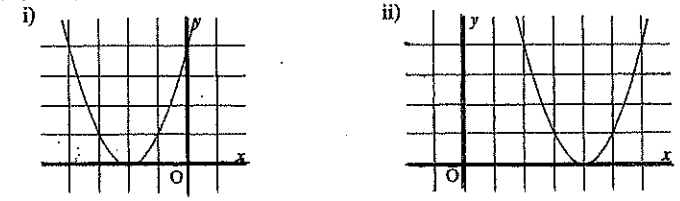
(A)

1. Sketch each set of graphs on the same grid.
   a) $y = x^2$ $y = (x - 2)^2$ $y = (x + 4)^2$
   b) $y = x^2$ $y = (x + 3)^2$ $y = (x - 6)^2$
   c) $y = x^2$ $y = (x - 4)^2$ $y = (x + 6)^2$

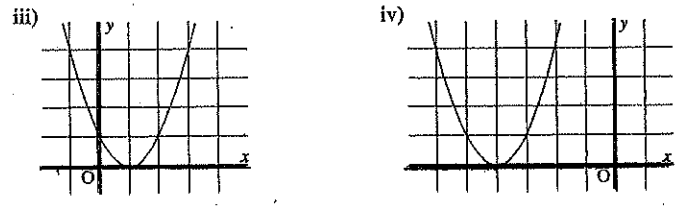
2. Compare the graphs of $y = x^2$ and $y = (x - p)^2$ when:
   a) $p < 0$ b) $p > 0$.

3. Which graph best represents each equation?
   a) $y = (x - 1)^2$ b) $y = (x + 2)^2$ c) $y = (x + 4)^2$ d) $y = (x - 4)^2$

i) ii)

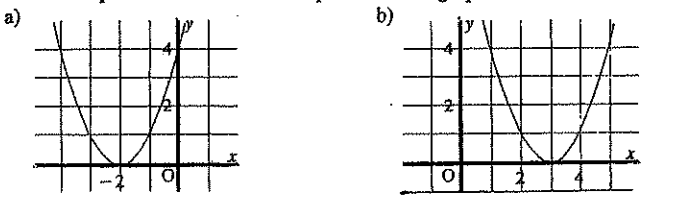


iii) iv)

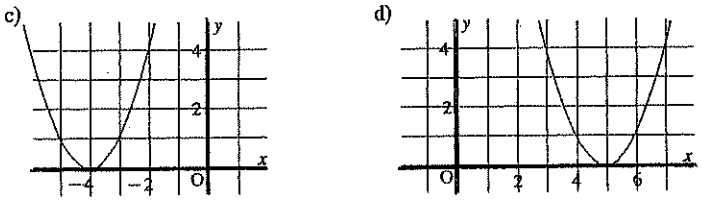


4. Write an equation that could correspond to each graph.

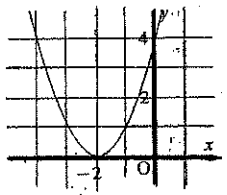
a) b)

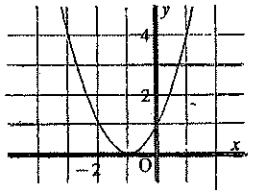


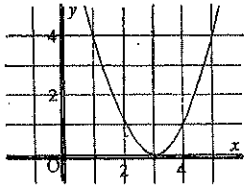
c) d)

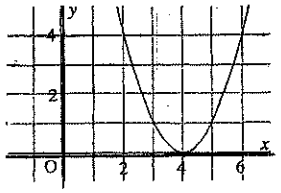


5. For each graph state:
   i) the coordinates of the vertex
   ii) the equation of the axis of symmetry
   iii) the direction of opening
   iv) the y-intercept

a) 

b) 

c) 

d) 

Ⓑ

6. State the equation of each parabola in *Exercise 5*.

7. For each parabola state:
   i) the coordinates of the vertex
   ii) the equation of the axis of symmetry
   iii) the direction of opening
   iv) the y-intercept
   a) $y = (x + 3)^2$ b) $y = (x - 8)^2$ c) $y = (x - 2)^2$ d) $y = (x + 4)^2$

8. Sketch the graphs of the parabolas in *Exercise 7*.

9. Sketch the graph of each parabola.
   a) $y = (x - 2)^2$ b) $y = (x + 5)^2$ c) $y = (x - 6)^2$ d) $y = (x + 2)^2$

EXERCISES 6-4

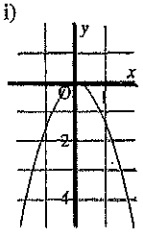
Ⓐ

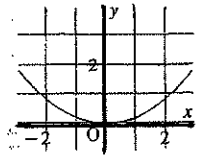
1. a) Make a table of values and graph the equations on the same grid for $-5 \leq x \leq 5$.

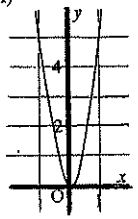
   $y = x^2$ $y = 3x^2$ $y = \frac{1}{2}x^2$ $y = -x^2$ $y = -\frac{1}{3}x^2$ $y = -4x^2$

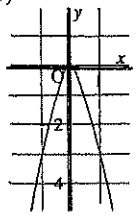
   b) Describe the effect on the graph of $y = ax^2$ as the value of a varies.

2. Which graph best represents each equation?
   a) $y = 5x^2$ b) $y = 0.2x^2$ c) $y = -1.5x^2$ d) $y = -3x^2$

i) 

ii) 

iii) 

iv) 

Ⓑ

3. Sketch each set of parabolas on the same grid.

   a) $y = x^2$ $y = 3x^2$ $y = \frac{1}{2}x^2$

   b) $y = x^2$ $y = -x^2$ $y = 5x^2$ $y = -3x^2$

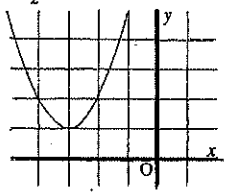
4. Find the equation of the parabola with vertex (0, 0) which passes through each point.
   a) (3, 18) b) (4, −16) c) (6, −9) d) (2, 24)

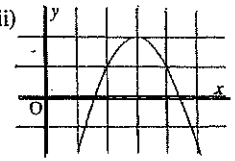
5. Find the equation of the parabola with vertex (0, 0) which passes through each point.
   a) (2, −10) b) (3, 5) c) $\left(\frac{3}{2}, \frac{1}{3}\right)$ d) $(-\sqrt{2}, -6)$

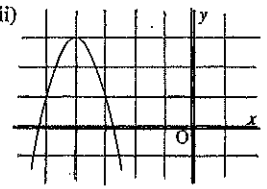
EXERCISES 6-5

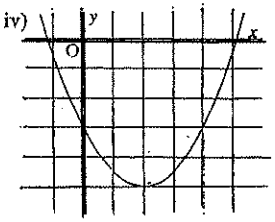
Ⓐ

1. Which graph best represents each equation?
   a) $y = (x + 3)^2 + 1$ b) $y = -2(x + 4)^2 + 3$
   c) $y = \frac{1}{2}(x - 2)^2 - 5$ d) $y = -(x - 3)^2 + 2$

i) 

ii) 

iii) 

iv) 

2. Sketch each set of graphs on the same grid.
   a) $y = (x - 5)^2 + 4$ $y = (x - 5)^2 + 2$ $y = (x - 5)^2$
      $y = (x - 5)^2 - 2$ $y = (x - 5)^2 - 4$
   b) $y = (x - 5)^2 + 4$ $y = (x - 3)^2 + 4$ $y = (x - 1)^2 + 4$
      $y = (x + 1)^2 + 4$ $y = (x + 3)^2 + 4$ $y = (x + 5)^2 + 4$
   c) $y = (x - 5)^2 + 4$ $y = 3(x - 5)^2 + 4$ $y = \frac{1}{2}(x - 5)^2 + 4$
      $y = -\frac{1}{2}(x - 5)^2 + 4$ $y = -(x - 5)^2 + 4$ $y = -3(x - 5)^2 + 4$

Ⓑ

3. For each parabola state:
   i) the coordinates of the vertex
   ii) the equation of the axis of symmetry
   iii) the y-intercept
   iv) the x-intercepts, if any.
   a) $y = (x - 5)^2 + 2$ b) $y = 2(x + 3)^2 - 8$
   c) $y = -4(x + 1)^2 + 4$ d) $y = \frac{1}{2}(x - 2)^2 - 8$

4. Sketch the graphs of the functions in *Exercise 3*.

5. On a sketch of the graph of each parabola, show:
   i) the coordinates of the vertex
   ii) the equation of the axis of symmetry
   iii) the coordinates of two points on the graph.
   a) $y = (x + 2)^2 - 5$ b) $y = -(x - 3)^2 + 2$
   c) $y = -\frac{1}{2}(x - 4)^2 - 1$ d) $y = 2(x + 1)^2 + 4$
   e) $y = -2(x - 1)^2 + 3$ f) $y = 4(x - 5)^2 - 10$

6. Sketch the graph of each parabola.
   a) $k = 2(l - 3)^2 - 1$
   b) $r = -2(t + 3)^2 + 5$
   c) $m = \frac{1}{2}(n - 4)^2 - 3$
   d) $p = 3(q - 5)^2 + 1$

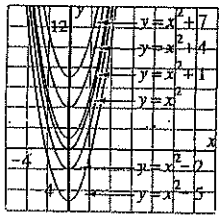
7. Write the equation of each parabola.
   a) with vertex $(4, -1)$, that opens up, and is congruent to $y = 2x^2$
   b) with vertex $(-2, 3)$, that opens down, and is congruent to $y = \frac{1}{3}x^2$
   c) with vertex $(-3, 2)$, that opens down, and is congruent to $y = \frac{1}{2}x^2$
   d) with vertex $(3, -4)$, x-intercepts 1 and 5

8. Write the equation of each parabola.
   a) with vertex $(3, -1)$, x-intercepts 2 and 4
   b) with vertex $(-1, 4)$, y-intercept 2
   c) with vertex $(2, -27)$, y-intercept -15

Answers

Exercises 6-2

1. a)



b) The vertex is on the y-axis. When q is positive, the vertex is q units above the x-axis. When q is negative, it is q units below the x-axis.

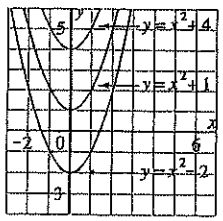
2. a) iii b) iv c) ii d) i

3. a) $y = x^2 + 5$ b) $y = x^2$ c) $y = x^2 - 2$ d) $y = x^2 - 6$

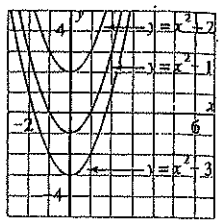
4. a) i) up ii) (0, 1) iii) 1
b) i) up ii) (0, −4) iii) −4 iv) ±2
c) i) up ii) (0, 3) iii) 3
d) i) up ii) (0, −6) iii) −6 iv) ±2.5

5. a) i) up ii) (0, 5) iii) 5
b) i) up ii) (0, −3) iii) −3 iv) ±1.7
c) i) up ii) (0, 2) iii) 2
d) i) up ii) (0, 4) iii) 4

6. a)

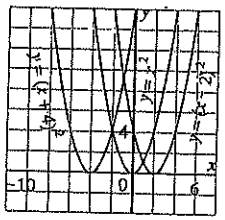


b)

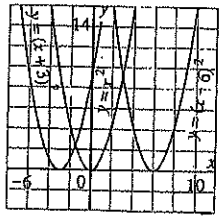


Exercises 6-3

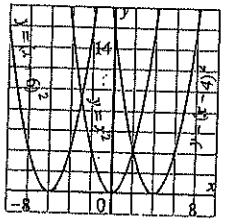
1. a)



b)



c)



2. a) When $p < 0$, the graph of $y = (x - p)^2$ is to the left of that of $y = x^2$.
b) When $p > 0$, the graph of $y = (x - p)^2$ is to the right of that of $y = x^2$.

3. a) iii b) i c) iv d) ii

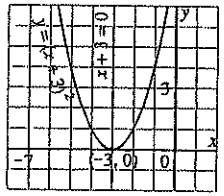
4. a) $y = (x + 2)^2$ b) $y = (x - 3)^2$
c) $y = (x + 4)^2$ d) $y = (x - 5)^2$

5. a) i) (−2,0) ii) $x + 2 = 0$ iii) up iv) 4
b) i) (−1,0) ii) $x + 1 = 0$ iii) up iv) 1
c) i) (3,0) ii) $x - 3 = 0$ iii) up iv) 9
d) i) (4,0) ii) $x - 4 = 0$ iii) up iv) 16

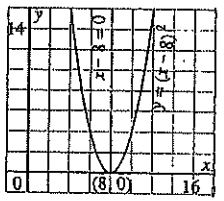
6. a) $y = (x + 2)^2$ b) $y = (x + 1)^2$
c) $y = (x - 3)^2$ d) $y = (x - 4)^2$

7. a) i) (−3,0) ii) $x + 3 = 0$ iii) up iv) 9
b) i) (8,0) ii) $x - 8 = 0$ iii) up iv) 64
c) i) (2,0) ii) $x - 2 = 0$ iii) up iv) 4
d) i) (−4,0) ii) $x + 4 = 0$ iii) up iv) 16

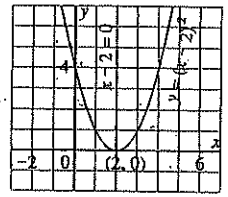
8. a)



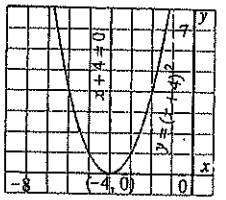
b)



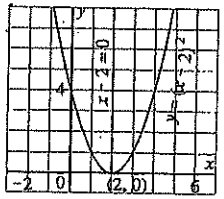
c)



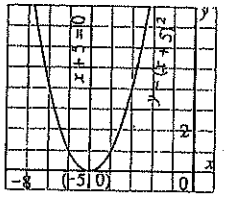
d)



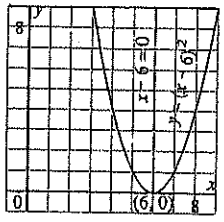
9. a)



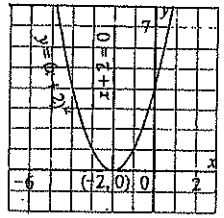
b)



c)

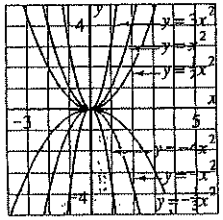


d)



Exercises 6-4

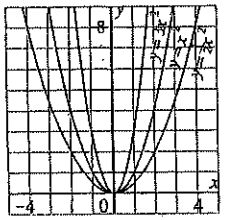
1. a)



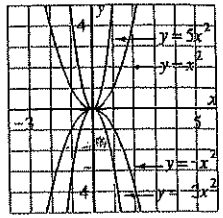
b) The parabola is expanded more: as a increases when $a > 0$; and as a decreases when $a < 0$.

2. a) iii **b)** ii **c)** i **d)** iv

3. a)



b)



4. a) $y = 2x^2$ **b)** $y = -x^2$ **c)** $y = -\frac{1}{4}x^2$

d) $y = 6x^2$

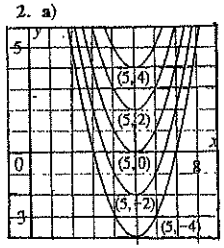
5. a) $y = -2.5x^2$ **b)** $y = \frac{5}{9}x^2$ **c)** $y = \frac{4}{27}x^2$

d) $y = -3x^2$

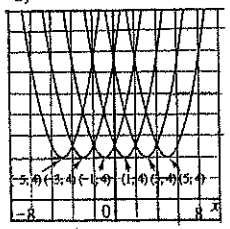
Exercises 6-5

1. a) i **b)** iii **c)** iv **d)** ii

2. a)



b)



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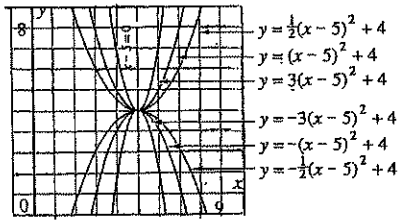


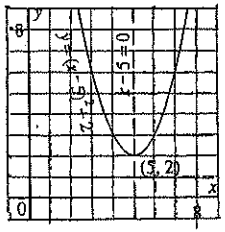
3. a) i) (5,2) ii) $x - 5 = 0$ iii) 27

b) i) $(-3,-8)$ ii) $x + 3 = 0$ iii) 10 iv) $-1,-5$

c) i) $(-1,4)$ ii) $x + 1 = 0$ iii) 0 iv) $0,-2$

d) i) $(2,-8)$ ii) $x - 2 = 0$ iii) -6 iv) $6,-2$

4. a)



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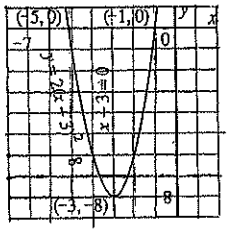
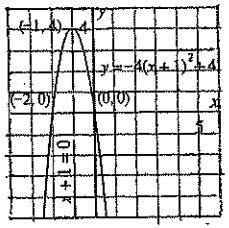
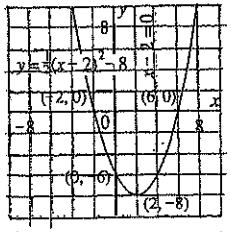


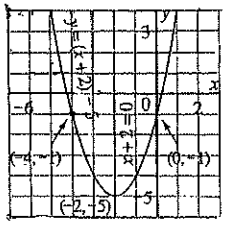
c)



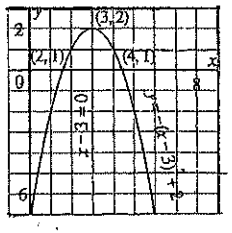
d)



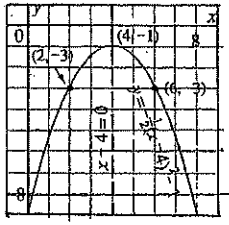
5. a)



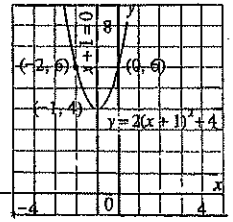
b)



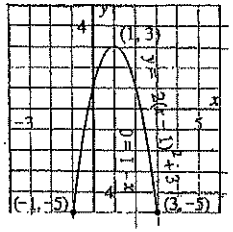
c)



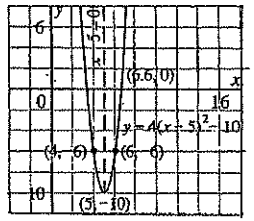
d)



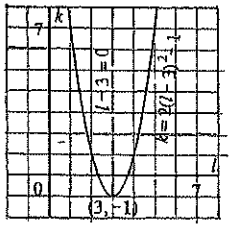
e)



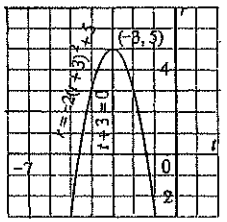
f)



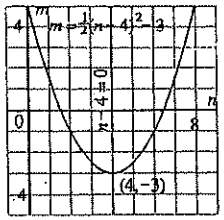
6. a)



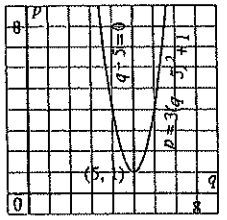
b)



c)



d)



7. a) $y = 2(x - 4)^2 - 1$

b) $y = -\frac{1}{3}(x + 2)^2 + 3$

c) $y = -\frac{1}{2}(x + 3)^2 + 2$

d) $y = (x - 3)^2 - 4$

8. a) $y = (x - 3)^2 - 1$

b) $y = -2(x + 1)^2 + 4$

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