

1 Express each of these in the form  $a(x+p)^2 + q$  by completing the square.

- (a)  $x^2 + 4x - 1$                       (b)  $x^2 - 10x + 3$                       (c)  $7 - 2x - x^2$   
 (d)  $3x^2 - 18x - 6$                       (e)  $2x^2 + 4x + 1$

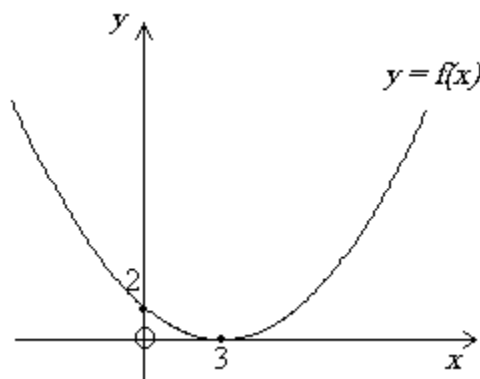
2 By completing the square, find the maximum value of  $\frac{4}{x^2 + 2x + 9}$ , when  $x^2 + 2x + 9 > 0$ .

3 Sketch the following graphs using the 'completing the square' method.

- (a)  $y = x^2 - 6x + 11$                       (b)  $y = x^2 - 2x - 3$

4 Below is the graph  $y = f(x)$ , on separate diagrams sketch the graphs of the related functions (a) to (d).

Mark clearly the images of the points shown on the graph of  $y = f(x)$  and their coordinates



- (a)  $y = f(x) + 2$   
 (b)  $y = 2f(x)$   
 (c)  $y = -f(x)$   
 (d)  $y = f(x+2)$

5 Sketch the graphs of:

- (a)  $y = 3^x$                                       (b)  $y = \log_{10}(x-2)$

6 Find the values of  $a$  and  $b$  for these curves.

