

# Completing the Square

## ANSWERS



**Section A:** Express in the form  $(x + a)^2 + b$ .

- 1)  $x^2 + 2x$   $(x + 1)^2 - 1$       5)  $x^2 + 2x - 6$   $(x + 1)^2 - 7$       9)  $x^2 + 3x$   $(x + \frac{3}{2})^2 - \frac{9}{4}$   
 2)  $x^2 + 6x$   $(x + 3)^2 - 9$       6)  $x^2 + 8x - 1$   $(x + 4)^2 - 17$       10)  $x^2 - 7x$   $(x - \frac{7}{2})^2 - \frac{49}{4}$   
 3)  $x^2 - 4x$   $(x - 2)^2 - 4$       7)  $x^2 - 4x + 5$   $(x - 2)^2 + 1$       11)  $x^2 + x + 4$   $(x + \frac{1}{2})^2 + \frac{15}{4}$   
 4)  $x^2 - 10x$   $(x - 5)^2 - 25$       8)  $x^2 - 10x - 7$   $(x - 5)^2 - 32$       12)  $x^2 - 3x + 1$   $(x - \frac{3}{2})^2 - \frac{5}{4}$

**Section B:** Express in the form  $a(x + b)^2 + c$ .

- 1)  $2x^2 + 8x + 10$   $2(x + 2)^2 + 2$       5)  $4x^2 + 8x - 5$   $4(x + 1)^2 - 9$       9)  $2x^2 + 3x - 5$   $2(x + \frac{3}{4})^2 - \frac{49}{8}$   
 2)  $3x^2 - 12x + 2$   $3(x - 2)^2 - 10$       6)  $3x^2 - 12x + 7$   $3(x - 2)^2 - 5$       10)  $3x^2 - 2x + 13$   $3(x - \frac{1}{3})^2 + \frac{2}{3}$   
 3)  $4x^2 + 24x - 8$   $4(x + 3)^2 - 44$       7)  $2x^2 - 16x + 13$   $2(x - 4)^2 - 19$       11)  $4x^2 - 2x - 9$   $4(x - \frac{1}{4})^2 - \frac{37}{4}$   
 4)  $5x^2 - 20x - 15$   $5(x - 2)^2 - 35$       8)  $5x^2 + 20x - 6$   $5(x + 2)^2 - 26$       12)  $12x^2 + 3x + 10$   $12(x + \frac{1}{8})^2 + \frac{157}{16}$

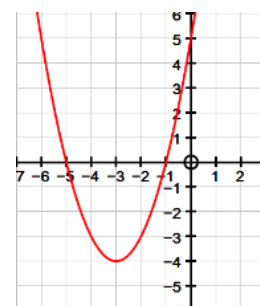
**Section C:** Solve the equations by completing the square, leaving your answers as surds where appropriate.

- 1)  $y = x^2 + 2x - 3$   $-3, 1$       4)  $y = 2x^2 + 4x + 1$   $\pm\sqrt{\frac{1}{2}} - 1$       7)  $y = 2x^2 + x - 4$   $\frac{\pm\sqrt{33-1}}{4}$   
 2)  $y = x^2 - 4x - 9$   $\pm\sqrt{13} + 2$       5)  $y = 4x^2 - 16x - 9$   $-0.5, 4.5$       8)  $y = 4x^2 - 4x - 11$   $\pm\sqrt{3} + \frac{1}{2}$   
 3)  $y = x^2 - 6x - 10$   $\pm\sqrt{19} + 3$       6)  $y = 3x^2 - 9x - 8$   $\pm\sqrt{\frac{59}{12}} + \frac{3}{2}$       9)  $y = -x^2 + x + \frac{1}{2}$   $\pm\sqrt{\frac{3}{4}} + \frac{1}{2}$

### Extension

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

- A. Write down the minimum point of the curve.  $(-3, -4)$   
 B. Write down the coordinates of the point where the curve crosses the x-axis.  $(-1, 0)$   $(-5, 0)$   
 C. Write down the coordinates of the point where the curve crosses the y-axis.  $(0, 5)$   
 D. What is the line of symmetry of the curve?  $x = -3$   
 E. Sketch the curve showing the exact coordinates of its turning point and where it crosses the x and y axes.



Repeat the steps above for the curve  $y = 3x^2 + 6x - 5$