Complete the Square

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1) Complete the Square: Easier

1) Write $x^2 + 8x + 16$ in the form $(x + a)^2$

$(x + 4)(x + 4) = (x + 4)^2$

.... $(x + 4)^2$ ....

(1 mark)

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2) Write $x^2 - 10x - 25$ in the form $(x - a)^2$

$(x - 5)(x - 5) = (x - 5)^2$

.... $(x - 5)^2$ ....

(1 mark)

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3) Write $x^2 - 4x + 10$ in the form $(x - 2)^2 + a$

$x^2 - 4x + 10$
$= (x - 2)^2 - 2^2 + 10$
$= (x - 2)^2 + 6$

.... $(x - 2)^2 + 6$ ....

(2 marks)

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4) Write $x^2 + 6x - 4$ in the form $(x + a)^2 + b$

$x^2 + 6x - 4$
$= (x + 3)^2 - 3^2 - 4$
$= (x + 3)^2 - 13$

.... $(x + 3)^2 - 13$ ....

(2 marks)

1) Complete the Square: Medium

5) i) Write $x^2 - 16x + 9$ in the form $(x + a)^2 + b$

$x^2 - 16x + 9$

$= (x - 8)^2 - 8^2 + 9$

$= (x - 8)^2 - 55$

.... $(x - 8)^2 - 55$............

(2 marks)

ii) Hence write down the coordinates of the minimum point of $y = x^2 - 16x + 9$

$(\quad 8 \quad , \quad -55 \quad)$

(1 mark)

6) a) Write $x^2 + 5x + 1$ in the form $(x + a)^2 + b$

$x^2 + 5x + 1$

$= \left(x + \frac{5}{2}\right)^2 - \left(\frac{5}{2}\right)^2 + 1$

$= \left(x + \frac{5}{2}\right)^2 - \frac{25}{4} + \frac{4}{4}$

$= \left(x + \frac{5}{2}\right)^2 - \frac{21}{4}$

..............$= \left(x + \frac{5}{2}\right)^2 - \frac{21}{4}$.....

(3 marks)

b) Hence write down the coordinates of the minimum point of $f(x) = x^2 + 5x + 1$

$\left(\quad -\frac{5}{2} \quad , \quad -\frac{21}{4} \quad \right)$

(1 mark)

1) Complete the Square: Harder

7) i) Write $x^2 - 4x$ in the form $(x - b)^2 + c$

$x^2 - 4x = (x - 2)^2 - 4$

.... $(x - 2)^2 - 4$............

(2 marks)

ii) Hence, or otherwise, write $2x^2 - 8x$ in the form $a(x - b)^2 + c$

$2x^2 - 8x$
$= 2[x^2 - 4x]$
$= 2[(x - 2)^2 - 4]$
$= 2(x - 2)^2 - 2 \times 4$
$= 2(x - 2)^2 - 8$

............$2(x - 2)^2 - 8$............

(2 marks)

8) a) Write $3x^2 + 18x + 40$ in the form $a(x + b)^2 + c$

$3x^2 + 18x + 40$
$= 3[x^2 + 6x] + 40$
$= 3[(x + 3)^2 - 9] + 40$
$= 3(x + 3)^2 - 3 \times 9 + 40$
$= 3(x + 3)^2 + 13$

.......$3(x + 3)^2 + 13$............

(3 mark)

b) Hence, or otherwise, write down the coordinates of the turning point of the graph of
$y = 3x^2 + 15x - 10$

(-3 , 13)

(1 mark)