

Harder Completing the Square

Write each of these expressions in the form $a(x + b)^2 + c$

(a)	(b)	(c)	(d)
$\begin{aligned}2x^2 + 4x + 1 \\= 2[x^2 + 2x] + 1 \\= 2[(x + 1)^2 - 1] + 1 \\= 2(x + 1)^2 - 2 + 1 \\= 2(x + 1)^2 - 1\end{aligned}$	$\begin{aligned}2x^2 + 8x - 5 \\= 2[x^2 + 4x] - 5 \\= 2[(x + 2)^2 - 4] - 5 \\= 2(x + 2)^2 - 8 - 5 \\= 2(x + 2)^2 - 13\end{aligned}$	$\begin{aligned}2x^2 - 12x + 9 \\= 2[x^2 - 6x] + 9 \\= 2[(x - 3)^2 - 9] + 9 \\= 2(x - 3)^2 - 18 + 9 \\= 2(x - 3)^2 - 9\end{aligned}$	$\begin{aligned}3x^2 - 6x + 4 \\= 3[x^2 - 2x] + 4 \\= 3[(x - 1)^2 - 1] + 4 \\= 3(x - 1)^2 - 3 + 4 \\= 3(x - 1)^2 + 1\end{aligned}$
(e)	(f)	(g)	(h)
$\begin{aligned}2x^2 - 8x + 3 \\= 2(x - 2)^2 - 5\end{aligned}$	$\begin{aligned}3x^2 + 12x - 2 \\= 3(x + 2)^2 - 14\end{aligned}$	$\begin{aligned}2x^2 + 2x + 11 \\= 2\left(x + \frac{1}{2}\right)^2 + \frac{21}{2}\end{aligned}$	$\begin{aligned}3x^2 - 9x - 7 \\= 3\left(x - \frac{3}{2}\right)^2 - \frac{55}{4}\end{aligned}$

Write each of these expressions in the form $a - b(x + c)^2$

(i)	(j)	(k)	(l)
$\begin{aligned}5 - 4x - 2x^2 \\= -2x^2 - 4x + 5 \\= -2[x^2 + 2x] + 5 \\= 7 - 2(x + 1)^2\end{aligned}$	$\begin{aligned}7 + 8x - 2x^2 \\= 15 - 2(x - 2)^2\end{aligned}$	$\begin{aligned}14 - 6x - 3x^2 \\= 17 - 3(x + 1)^2\end{aligned}$	$\begin{aligned}9 - 12x - 2x^2 \\= 27 - 2(x + 3)^2\end{aligned}$