

Completing the Square : 1 : Answers

$$\begin{aligned} 1) \quad & x^2 + 4x + 1 \\ &= (x+2)^2 - 4 + 1 \\ &= (x+2)^2 - 3 \end{aligned}$$

$$\begin{aligned} 2) \quad & x^2 - 2x + 3 \\ &= (x-1)^2 - 1 + 3 \\ &= (x-1)^2 + 2 \end{aligned}$$

$$\begin{aligned} 3) \quad & x^2 - 6x - 2 \\ &= (x-3)^2 - 9 - 2 \\ &= (x-3)^2 - 11 \end{aligned}$$

$$\begin{aligned} 4) \quad & x^2 + \frac{2}{3}x - 1 \\ &= \left(x + \frac{1}{3}\right)^2 - \frac{1}{9} - 1 \\ &= \left(x + \frac{1}{3}\right)^2 - \frac{10}{9} \end{aligned}$$

$$\begin{aligned} 5) \quad & x^2 - \frac{3}{5}x + 3 \\ &= \left(x - \frac{3}{10}\right)^2 - \frac{9}{100} + 3 \\ &= \left(x - \frac{3}{10}\right)^2 + \frac{291}{100} \end{aligned}$$

$$\begin{aligned} 6) \quad & 2x^2 + 4x - 7 \\ &= 2\left[x^2 + 2x - \frac{7}{2}\right] \\ &= 2\left[(x+1)^2 - 1 - \frac{7}{2}\right] \\ &= 2\left[(x+1)^2 - \frac{9}{2}\right] \\ &= 2(x+1)^2 - 9 \end{aligned}$$

$$\begin{aligned} 7) \quad & 2x^2 - 5x + 1 \\ &= 2\left[x^2 - \frac{5}{2}x + \frac{1}{2}\right] \\ &= 2\left[\left(x - \frac{5}{4}\right)^2 - \frac{25}{16} + \frac{8}{16}\right] \\ &= 2\left[\left(x - \frac{5}{4}\right)^2 - \frac{17}{16}\right] \\ &= 2\left(x - \frac{5}{4}\right)^2 - \frac{17}{8} \end{aligned}$$

$$\begin{aligned} 8) \quad & 3x^2 + 6x - 2 \\ &= 3\left[x^2 + 2x - \frac{2}{3}\right] \\ &= 3\left[(x+1)^2 - 1 - \frac{2}{3}\right] \\ &= 3\left[(x+1)^2 - \frac{5}{3}\right] \\ &= 3(x+1)^2 - 5 \end{aligned}$$

$$\begin{aligned} 9) \quad & 3x^2 - 2x + 1 \\ &= 3\left[x^2 - \frac{2}{3}x + \frac{1}{3}\right] \\ &= 3\left[\left(x - \frac{1}{3}\right)^2 - \frac{1}{9} + \frac{3}{9}\right] \\ &= 3\left[\left(x - \frac{1}{3}\right)^2 + \frac{2}{9}\right] \\ &= 3\left(x - \frac{1}{3}\right)^2 + \frac{2}{3} \end{aligned}$$

$$\begin{aligned} 10) \quad & 5x^2 - 10x + 2 \\ &= 5\left[x^2 - 2x + \frac{2}{5}\right] \\ &= 5\left[(x-1)^2 - 1 + \frac{2}{5}\right] \\ &= 5\left[(x-1)^2 - \frac{3}{5}\right] \\ &= 5(x-1)^2 - 3 \end{aligned}$$

$$\begin{aligned}
 11) \quad & 5x^2 + 3x - 10 \\
 &= 5 \left[x^2 + \frac{3}{5}x - 2 \right] \\
 &= 5 \left[\left(x + \frac{3}{10} \right)^2 - \frac{9}{100} - \frac{200}{100} \right] \\
 &= 5 \left[\left(x + \frac{3}{10} \right)^2 - \frac{209}{100} \right] \\
 &= 5 \left(x + \frac{3}{10} \right)^2 - \frac{209}{20}
 \end{aligned}$$

$$\begin{aligned}
 12) \quad & -2x^2 - 4x + 1 \\
 &= -2 \left[x^2 + 2x - \frac{1}{2} \right] \\
 &= -2 \left[(x+1)^2 - 1 - \frac{1}{2} \right] \\
 &= -2 \left[(x+1)^2 - \frac{3}{2} \right] \\
 &= -2(x+1)^2 + 3
 \end{aligned}$$

$$\begin{aligned}
 13) \quad & -3x^2 + 5x - 4 \\
 &= -3 \left[x^2 - \frac{5}{3}x + \frac{4}{3} \right] \\
 &= -3 \left[\left(x - \frac{5}{6} \right)^2 - \frac{25}{36} + \frac{48}{36} \right] \\
 &= -3 \left[\left(x - \frac{5}{6} \right)^2 + \frac{23}{36} \right] \\
 &= -3 \left(x - \frac{5}{6} \right)^2 - \frac{23}{12}
 \end{aligned}$$

$$\begin{aligned}
 14) \quad & -x^2 - 2x + 1 \\
 &= - \left[x^2 + 2x - 1 \right] \\
 &= - \left[(x+1)^2 - 1 - 1 \right] \\
 &= - \left[(x+1)^2 - 2 \right] \\
 &= -(x+1)^2 + 2
 \end{aligned}$$