

## Completing the Square

Solve each equation by completing the square.

1.  $2p^2 + 8p = 7$

2.  $\frac{1}{2}r^2 - 6r = 2$

3.  $2x^2 + 5x = -3$

4.  $2y^2 + 3y - 5 = 4$

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1.  $2p^2 + 8p = 7$

$$\begin{aligned}2(p^2 + 4p + 4) &= 7 + 8 \\2(p + 2)^2 &= 15 \\(p + 2)^2 &= \frac{15}{2} \\(p + 2) &= \pm \sqrt{\frac{15}{2}} \\p &= -2 \pm \sqrt{\frac{15}{2}} \\p &= -2 + \sqrt{\frac{15}{2}} \text{ or } -2 - \sqrt{\frac{15}{2}}\end{aligned}$$

2.  $\frac{1}{2}r^2 - 6r = 2$

$$\begin{aligned}\frac{1}{2}(r^2 - 12r + 36) &= 2 + 18 \\ \frac{1}{2}(r - 6)^2 &= 20 \\ (r - 6)^2 &= 40 \\ r - 6 &= \pm\sqrt{40} \\ r &= 6 \pm \sqrt{40} = 6 \pm 2\sqrt{10}\end{aligned}$$

3.  $2x^2 + 5x = -3$

$$\begin{aligned}2\left(x^2 + \frac{5}{2}x\right) &= -3 \\2\left(x^2 + \frac{5}{2}x + \left(\frac{5}{4}\right)^2\right) &= -3 + 2\left(\frac{5}{4}\right)^2 \\2\left(x + \frac{5}{4}\right)^2 &= \frac{1}{8} \\ \left(x + \frac{5}{4}\right)^2 &= \frac{1}{16} \\ x + \frac{5}{4} &= \pm\sqrt{\frac{1}{16}} = \pm\frac{1}{4} \\ x &= \frac{5}{4} \pm \frac{1}{4} = 1 \text{ or } \frac{3}{2}\end{aligned}$$

4.  $2y^2 + 3y - 5 = 4$

$$\begin{aligned}2y^2 + 3y &= 4 + 5 \\2\left[y^2 + \left(\frac{3}{2}\right)y + \frac{9}{16}\right] &= 9 + \frac{9}{8} \\2\left(y + \frac{3}{4}\right)^2 &= \frac{81}{8} \\ \left(y + \frac{3}{4}\right)^2 &= \frac{81}{16} \\ \left(y + \frac{3}{4}\right) &= \pm\sqrt{\frac{81}{16}} \\ y &= -\frac{3}{4} \pm \frac{9}{4} \\ y &= \frac{3}{2} \text{ or } -3\end{aligned}$$

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