# Completing the Square

Consider $(x+a)^2$

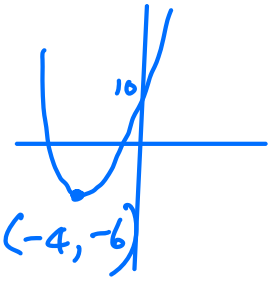
$$= (x+a)(x+a)$$
$$= x^2 + ax + ax + a^2$$
$$= x^2 + 2ax + a^2$$

Completing the square makes use of the relationship above

Ex 1 Complete the square for

$$x^2 + 8x + 10$$
$$= (x+4)^2 + 10 - 16$$
$$= (x+4)^2 - 6$$

$(x+a)(x+a)$
$= x^2 + 8x + 16$

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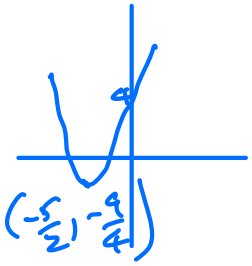
Ex 2 $x^2 + 5x + 4$

$$= \left(x + \frac{5}{2}\right)^2 + 4 - \frac{25}{4}$$
$$= \left(x + \frac{5}{2}\right)^2 - \frac{9}{4}$$



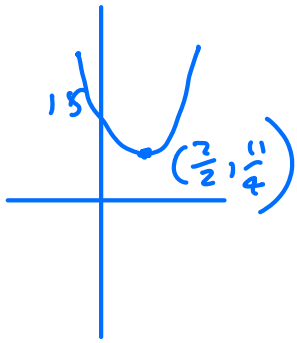
Ex 3

$$x^2 - 7x + 15$$

$$= (x - \tfrac{7}{2})^2 + 15 - \tfrac{49}{4}$$

$$= (x - \tfrac{7}{2})^2 + \tfrac{60}{4} - \tfrac{49}{4}$$

$$= (x - \tfrac{7}{2})^2 + \tfrac{11}{4}$$

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Ex 4

$$2x^2 + 14x + 9$$

$$2\left[x^2 + 7x + \tfrac{9}{2}\right]$$

$$2\left[(x + \tfrac{7}{2})^2 + \tfrac{9}{2} - \tfrac{49}{4}\right]$$

$$2(x + \tfrac{7}{2})^2 + 9 - \tfrac{49}{2}$$

$$= 2(x + \tfrac{7}{2})^2 - \tfrac{31}{2}$$

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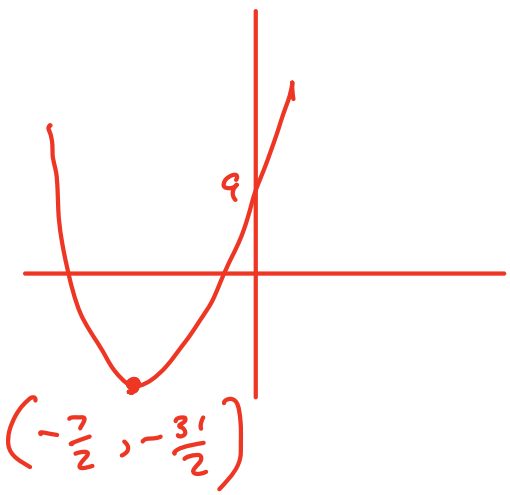

Ex5

$$3x^2 + 12x + 5$$

$$= 3\left[x^2 + 4x + \frac{5}{3}\right]$$

$$= 3\left[(x+2)^2 + \frac{5}{3} - 4\right]$$

$$= 3(x+2)^2 + 5 - 12$$

$$= 3(x+2)^2 - 7$$

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Ex6

$$y = -4x^2 + 20x - 15$$

$$y = -4\left[x^2 - 5x + \frac{15}{4}\right]$$

$$y = -4\left[(x - \frac{5}{2})^2 + \frac{15}{4} - \frac{25}{4}\right]$$

$$y = -4\left[(x - \frac{5}{2})^2 - \frac{10}{4}\right]$$

$$y = -4(x - \frac{5}{2})^2 + 10$$

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