

3.3 Completing the Square

Warm-up: Convert $y = 2(x+3)^2 - 4$ to standard form.

Check your
work...

$$y = 2(x+3)(x+3) - 4$$

$$y = 2(x^2 + 6x + 9) - 4$$

1. graph both forms
/ $y_1 =$

$$y = 2x^2 + 12x + 18 - 4$$

! $y_2 =$

$$y = 2x^2 + 12x + 14$$

2. Plug in an x into each

3. $x = -b/2a$

$$\longrightarrow x = \frac{-12}{2(2)} = -3 \quad (-3, -4)$$

$$y = 2(-3)^2 + 12(-3) + 14 = -4$$

ex) Complete the square for $y = x^2 + 12x - 5$

$$y = \underbrace{x^2 + 12x + 36}_{(x+6)^2} - 36 - 5$$

$$y = (x+6)(x+6) - 41$$

$$y = (x+6)^2 - 41$$

1. Move c out of the way.

2. Add $\left(\frac{b}{2}\right)^2$ & subtract $\left(\frac{b}{2}\right)^2$

3. Factor the P.S. and collect L.T.

$$\text{ex) C.T.S. } y = x^2 - 7x + 3$$

$$= \underbrace{x^2 - 7x + \frac{49}{4}} - \frac{49}{4} + 3$$

$$= \left(x - \frac{7}{2}\right)^2 - \frac{49}{4} + \frac{12}{4}$$

$$= \left(x - \frac{7}{2}\right)^2 - \frac{37}{4}$$

ex) C.T.S. $y = 3x^2 + 6x + 11$

$$= 3(x^2 + 2x + 1 - 1) + 11$$

Practice

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#2-8

$$= 3(x^2 + 2x + 1) + 11 - \underline{\underline{3}}$$

$$= 3(x+1)^2 + 8$$

Word Problem Ex. 4 pg. 190

\$10 fee per session

400 sessions

Proposed: \$1 increase in price \rightarrow 20 fewer sessions.

Last year's revenue: $\$10/\text{session} \times 400 \text{ sessions} = \4000

Cost this year: $(10 + 1n)$

Sessions this year: $(400 - 20n)$

Revenue this year: $(10 + 1n)(400 - 20n)$

$$R = (10 + 1n)(400 - 20n)$$

$$= 4000 - 200n + 400n - 20n^2$$

$$= -20n^2 + 200n + 4000$$

$$= -20(n^2 - 10n + 25 - 25) + 4000$$

$$= -20(n^2 - 10n + 25) + 4000 + 500$$

$$= -20(n - 5)^2 + 4500$$

\uparrow
of price
increases
(new price = \$15)

\uparrow
this year's
revenue

300 sessions
 $(400 - 20(5))$

pg. 193-197

9-12, 16

13-15, 17-24 (modelling)

25, 28, 29-31 (extend)