

Example 26**Self Tutor**

Solve for x : **a** $3x^2 - 1 = 8$

b $5 - 2x^2 = 11$

$$\begin{aligned} \text{a} \quad & 3x^2 - 1 = 8 \\ & \therefore 3x^2 = 9 \quad \{ + 1 \text{ to both sides} \} \\ & \therefore x^2 = 3 \quad \{ \div \text{ both sides by } 3 \} \\ & \therefore x = \pm\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{b} \quad & 5 - 2x^2 = 11 \\ & \therefore -2x^2 = 6 \quad \{ - 5 \text{ from both sides} \} \\ & \therefore x^2 = -3 \quad \{ \div \text{ both sides by } -2 \} \\ & \text{which has no real solutions as } x^2 \text{ cannot} \\ & \text{be negative.} \end{aligned}$$

Example 27**Self Tutor**Solve for x :

a $(x + 3)^2 = 36$

b $(x - 4)^2 = 7$

$$\begin{array}{ll} \text{a} \quad (x + 3)^2 = 36 & \text{b} \quad (x - 4)^2 = 7 \\ \therefore x + 3 = \pm\sqrt{36} & \therefore x - 4 = \pm\sqrt{7} \\ \therefore x + 3 = \pm 6 & \therefore x = 4 \pm \sqrt{7} \\ \therefore x = -3 \pm 6 & \\ \therefore x = 3 \text{ or } -9 & \end{array}$$

For equations of the form $(x \pm a)^2 = k$ we do not need to expand the brackets.

**Example 28****Self Tutor**Solve for x using the Null Factor law:

a $3x(x - 5) = 0$

b $(x - 4)(3x + 7) = 0$

$$\begin{aligned} \text{a} \quad & 3x(x - 5) = 0 \\ \therefore & 3x = 0 \text{ or } x - 5 = 0 \\ & \therefore x = 0 \text{ or } 5 \end{aligned}$$

$$\begin{aligned} \text{b} \quad & (x - 4)(3x + 7) = 0 \\ \therefore & x - 4 = 0 \text{ or } 3x + 7 = 0 \\ & \therefore x = 4 \text{ or } 3x = -7 \\ & \therefore x = 4 \text{ or } -\frac{7}{3} \end{aligned}$$

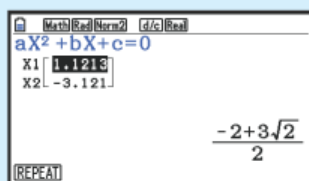
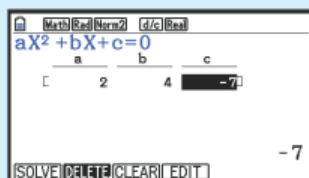
Example 29

Use technology to solve $2x^2 + 4x = 7$.

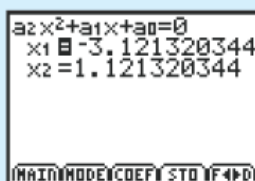
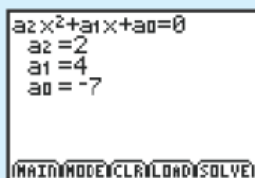
$$2x^2 + 4x = 7$$

$$\therefore 2x^2 + 4x - 7 = 0$$

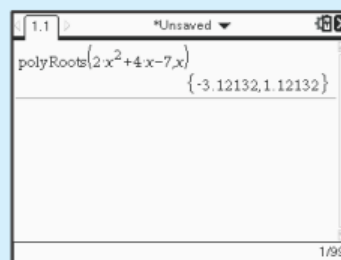
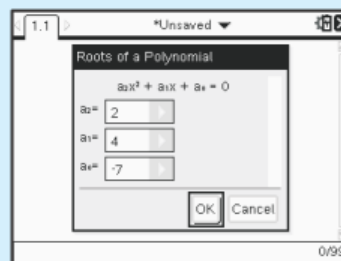
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So, $x \approx 1.12$ or -3.12 .

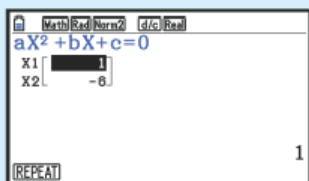
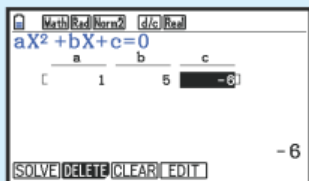
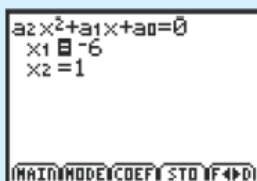
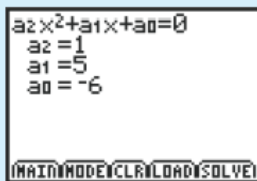
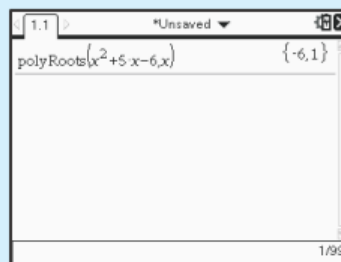
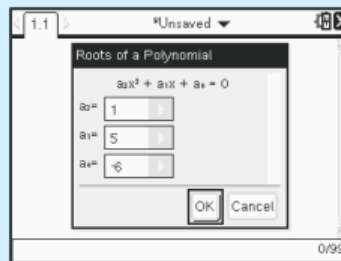
Example 30Solve for x : $3(x - 1) + x(x + 2) = 3$

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

$$\therefore 3x - 3 + x^2 + 2x = 3 \quad \{\text{expanding the brackets}\}$$

$$\therefore x^2 + 5x - 3 = 3 \quad \{\text{collecting like terms}\}$$

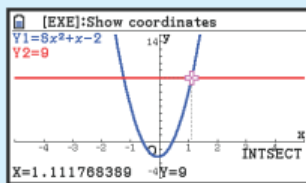
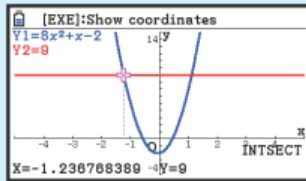
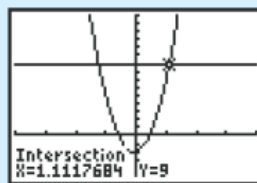
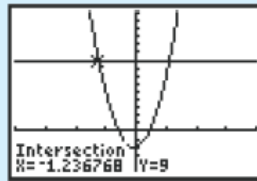
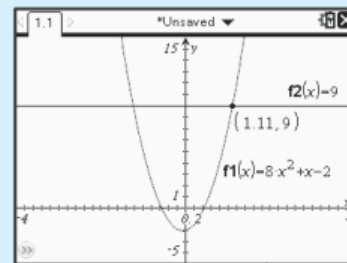
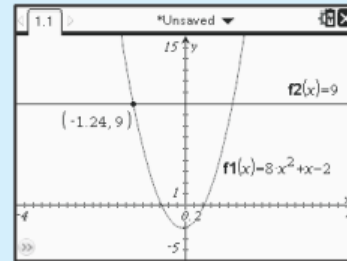
$$\therefore x^2 + 5x - 6 = 0 \quad \{\text{making the RHS zero}\}$$

Casio fx-CG20**TI-84 Plus****TI-nspire** $\therefore x = -6$ or 1

Example 32**Self Tutor**

Use graphical methods to solve $8x^2 + x - 2 = 9$.

We graph $Y_1 = 8X^2 + X - 2$ and $Y_2 = 9$ on the same set of axes, and find where the graphs intersect.

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So, $x \approx -1.24$ or 1.11 .

Example 34**Self Tutor**

A rectangle has length 3 cm longer than its width. Its area is 42 cm^2 . Find its width.

If the width is x cm then the length is $(x + 3)$ cm.

$$\therefore x(x + 3) = 42 \quad \{\text{equating areas}\}$$

$$\therefore x^2 + 3x - 42 = 0$$

$$\therefore x \approx -8.15 \text{ or } 5.15 \quad \{\text{using technology}\}$$

We reject the negative solution as lengths are positive.

So, the width ≈ 5.15 cm.

