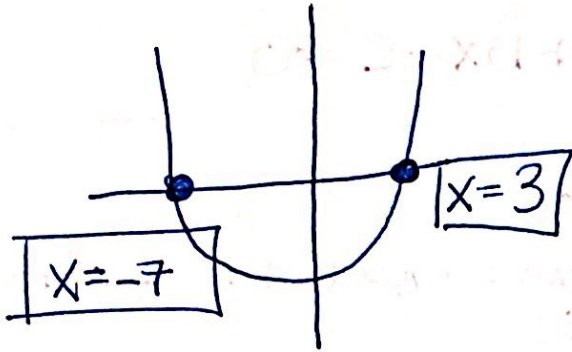


Solving Quadratics by Graphing

Example 1: Solve $x^2 + 4x - 21 = 0$



⇒ Two real roots

① Make sure the equation is equal to zero.

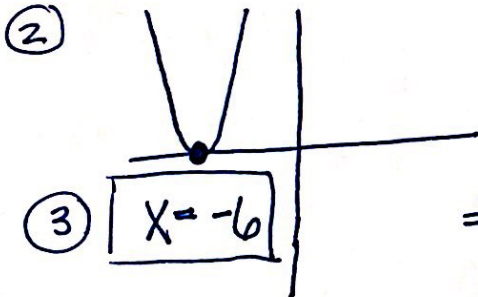
⇒ Everything is on one side

② Put into the calc.

③ Find the x-intercepts
⇒ These are your roots

Example 2: Solve $x^2 + 36 = -12x$

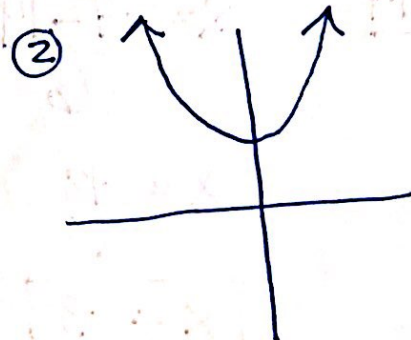
$$\begin{array}{r} \textcircled{1} \quad x^2 + 36 = -12x \\ \quad \quad +12x \quad \quad +12x \\ \hline x^2 + 12x + 36 = 0 \end{array}$$



③ ⇒ One real root

Example 3: Solve $x^2 + x - 4 = -7$

$$\begin{array}{r} \textcircled{1} \quad x^2 + x - 4 = -7 \\ \quad \quad +7 \quad \quad +7 \\ \hline x^2 + x + 3 = 0 \end{array}$$



③ No real roots

Solve using the Quadratic Formula

Quadratic Formula:
$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where $ax^2 + bx + c = 0$

Example 1: Solve $3x^2 + 4x - 3 = 12$

① $3x^2 + 4x - 3 = 12$
 $\quad \quad \quad -12 \quad -12$

$3x^2 + 4x - 15 = 0$

② $a = 3$ $b = 4$ $c = -15$

③
$$\frac{-4 \pm \sqrt{(4)^2 - 4(3)(-15)}}{2(3)}$$

④
$$\frac{-4 \pm \sqrt{196}}{6}$$

$$\frac{-4 \pm 14}{6}$$

⑤
$$\begin{array}{r} 196 \\ \swarrow \quad \searrow \\ 28 \quad \cancel{7} \\ \swarrow \quad \searrow \\ \cancel{4} \quad 4 \quad \boxed{2 \cdot 7 \sqrt{\quad}} \\ \swarrow \quad \searrow \\ \cancel{2} \quad \cancel{2} \quad = 14 \end{array}$$

⑥
$$x = \frac{-4 + 14}{6}$$

$$x = \frac{10}{6}$$

$$x = \frac{5}{3}$$

$$x = \frac{-4 - 14}{6}$$

$$x = \frac{-18}{6}$$

$$x = -3$$

\Rightarrow Two real roots

① Make sure equation is equal to zero

② Identify a, b, c

③ Substitute into Formula

④ Clean up the Formula

⑤ Simplify the radical

⑥ Simplify the fractions

Example 2: solve $4x^2 + 9 = 15x$

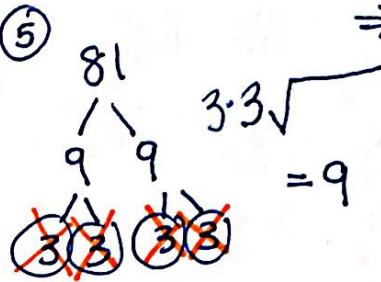
$$\textcircled{1} \quad \begin{array}{r} 4x^2 + 9 = 15x \\ -15x \quad -15x \\ \hline \end{array}$$

$$4x^2 - 15x + 9 = 0$$

$$\textcircled{2} \quad a=4 \quad b=-15 \quad c=9$$

$$\textcircled{3} \quad x = \frac{-(-15) \pm \sqrt{(-15)^2 - 4(4)(9)}}{2(4)}$$

$$\textcircled{4} \quad x = \frac{-(-15) \pm \sqrt{81}}{8} = \frac{15 \pm \sqrt{81}}{8} \rightarrow \textcircled{5}$$



\Rightarrow Two real roots

$$x = \frac{15 \pm 9}{8}$$

$$x = \frac{15+9}{8}$$

$$x = \frac{15-9}{8}$$

$$x = \frac{24}{8}$$

$$x = \frac{6}{8}$$

$$x = 3$$

$$x = \frac{3}{4}$$