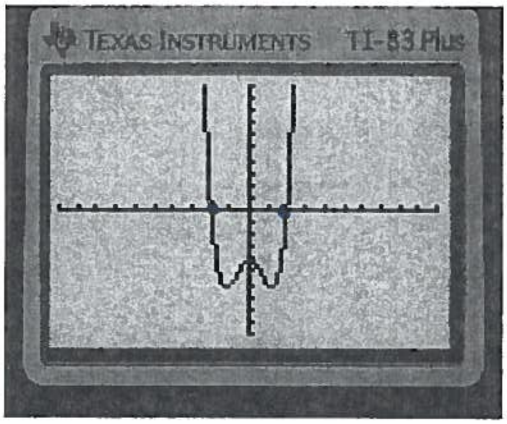
Key

Practice Quiz 6.4 – 6.6

Describe the possible roots for the quartic graphed below.



2 ℝ Roots $x=2$, $x=-2$

2 ℂ Roots

The graph crossed the x axis twice. Therefore there are two real solutions and 2 complex solutions.

Find the polynomial with integer coefficients that has the given numbers as roots:

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

- Fourth degree with roots at 0, -2, and 3 + *i*.

$\boxed{y = x^4 - x^3 + 4x^2 + 20x}$

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

$y = x(x+2)x^2 - x(3-i) - x(3+i) + (3-i)(3+i)$

$y = (x^2+2x)(x^2 - 3x + i - 3x - i + 9 - i^2)$

$y = (x^2+2x)(x^2-3x+10)$

$y = x^4 - 3x^3 + 10x^2 + 2x^3 - 6x^2 + 20x$

Solve the following:

$x^3 + 8 = 0$

$$\begin{array}{r|rrrr} -2 & 1 & 0 & 0 & 8 \\ & \downarrow & -2 & 4 & -8 \\ \hline & 1 & -2 & 4 & 0 \end{array}$$

$x^2 - 2x + 4$

$x = \frac{2 \pm \sqrt{4-4(1)(4)}}{2(1)}$

$\boxed{x=-2 \quad x = 1 \pm i\sqrt{3}}$

Use the Fundamental Theorem of Algebra to find all the complex roots for each polynomial.

$x^3 - 3x^2 + 4x - 12 = 0$

$$\begin{array}{r|rrrr} 3 & 1 & -3 & 4 & -12 \\ & \downarrow & 3 & 0 & 12 \\ \hline & 1 & 0 & 4 & 0 \end{array}$$

$x^2 + 4 = 0$

$x^2 = -4$

$x = \pm 2i$

$\boxed{x=3 \quad x=\pm 2i}$

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

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -4 & -1 & 2 \\ & \downarrow & 2 & 4 & 0 & -2 \\ \hline -1 & 1 & 2 & 0 & -1 & 0 \\ & \downarrow & -1 & -1 & 1 & \\ \hline & 1 & 1 & -1 & 0 & \end{array}$$

$x^2 + x - 1$

$x = \frac{-1 \pm \sqrt{1-4(1)(-1)}}{2(1)}$

$x = \frac{-1 \pm \sqrt{5}}{2}$

$\boxed{x=2 \quad x=-1 \quad x = \frac{-1\pm\sqrt{5}}{2}}$