Warm Up

Solve each equation by factoring.

1) $7m^2 + 13m - 2 = 0$

$m^2 + 13m - 14 = 0$

$(x-1)(x+14)=0$

$(7x-1)(x+2)=0$

$7x-1=0 \quad x+2=0$

$+1 \; +1 \quad -2 \; -2$

$\frac{7x}{7} = \frac{1}{7}$

$x = -2$

$x = 1/7$

Solve each equation with the quadratic formula.

2) $5x^2 - 7x + 10 = 0$

A: 5 B: -7 C: 10

$$\frac{7 \pm \sqrt{(-7)^2 - 4(5)(10)}}{2(5)}$$

$$\frac{7 \pm \sqrt{-151}}{10}$$

$$\frac{7 \pm i\sqrt{151}}{10}$$

Select a range:

low 2 high 32

21

Choose Random Number

FINDING ROOTS WITHOUT A CLUE

Rational Zero Theorem: If $f(x) = a_n x^n + ... + a_1 x + a_0$ has integer coefficients, then every rational zero of f has the following form:

p/q=factors of constant term/factors of leading coefficient term

USING THE RATIONAL ZERO THEOREM

- List the possible rational zeros of the function using the rational zero theorem:

$$f(x) = 1x^3 + 2x^2 - 11x - 12$$

- Factors of 12: 3, 4, 2, 6, 1, 12, -3, -4, -2, -6, -1, -12
- Factors of 1: 1, -1

- Quotients (Divide all factors of 12 by all factors of 1, use + AND -):

3, 4, 2, 6, 12, -3, -4, -2, -6, -1, -12

Find all of the roots of:

$g(x) = 4x^3 - 16x^2 + 11x + 3$

From Calculator:

$x = 3$

$$\begin{array}{r|rrrr} 3 & 4 & -16 & 11 & 3 \\ & \downarrow & 12 & -12 & -3 \\ \hline & 4x^2 & -4x & -1 & 0 \end{array}$$

$4x^2 - 4x - 1$

$a = 4, \; b = -4, \; c = -1$

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

$$= \frac{4 \pm \sqrt{32}}{8} = \frac{4 \pm 4\sqrt{2}}{8}$$

$$= \frac{1 \pm 1\sqrt{2}}{2}$$

Roots:

$x = \frac{1 \pm \sqrt{2}}{2}, 3$

Find all of the roots of:

$g(x) = x^4 + 2x^3 - 5x^2 - 4x + 6$

From Calculator:

$x = 1, -3$

$$\begin{array}{r|rrrrr} 1 & 1 & 2 & -5 & -4 & 6 \\ & & 1 & 3 & -2 & -6 \\ \hline & 1x^3 & 3x^2 & -2x & -6 & 0 \end{array}$$

$$\begin{array}{r|rrrr} -3 & 1 & 3 & -2 & -6 \\ & & -3 & 0 & 6 \\ \hline & 1x^2 & 0x & -2 & 0 \end{array}$$

$x^2 - 2$

$$x^2 - 2 = 0$$
$$+2 \quad +2$$
$$x^2 = 2$$
$$x = \pm\sqrt{2}$$

Roots:

$$x = \pm\sqrt{2}, 1, -3$$

Imaginary zeros don't cross x-axis!!!!

They are imaginary you can't see them on a graph.

Find all the roots

$f(x) = x^4 - 5x^3 + 7x^2 + 3x - 10$

From Calculator:

$x = -1, 2$

$2 \mid 1 \quad -5 \quad 7 \quad 3 \quad -10$

$\downarrow \quad 2 \quad -6 \quad 2 \quad 10$

$1 \quad -3 \quad 1 \quad 5 \mid 0$

$x^3 - 3x^2 + x + 5$

$-1 \mid 1 \quad -3 \quad 1 \quad 5$

$\downarrow \quad -1 \quad 4 \quad -5$

$1 \quad -4 \quad 5 \mid 0$

$x^2 - 4x + 5 = 0$

$\frac{4 \pm \sqrt{(-4)^2 - 4(1)(5)}}{2(1)}$

$\frac{4 \pm \sqrt{-4}}{2} = \frac{4 \pm 2i}{2}$

$x = 2 \pm i$

$x = -2 \pm i, -1, 2$