Honors Advanced Algebra DATE: 10/9

Target 2F: Solving Polynomials Algebraically and Graphically Using Technology

Example

1) $x^2 - 2x = -2x + 16$

$-16 \quad +2x \quad +2x \quad -16$

Think $x^2 + 0x - 16$

$x^2 - 16 = 0$ — Now we can solve

factor

Factored form: $(x-4)(x+4) = 0$

Factors of -16 that add up to zero? -16: $-4 \cdot 4$, $-4+4=0$ ✓

$x-4=0$ or $x+4=0$

$+4 \quad +4 \quad -4 \quad -4$

$x = 4$ or $x = -4$

2) $2x^3 - 5x^2 = 3x$

$-3x \quad -3x$

$2x^3 - 5x^2 - 3x = 0$ Now, solve

$x(2x^2 - 5x - 3) = 0$

factor using Lizie method

Multiply L.C. with constant term: $-2 \cdot 3 = -6$; $-6 : 1$; $-6 + 1 = -5$ ✓

$x(x - \frac{6}{2})(x + \frac{1}{2}) = 0$

Factored form: $x(x-3)(2x+1) = 0$

Don't forget to ÷ by L.C when you finish

$x = 0$ or $x - 3 = 0$ or $2x + 1 = 0$

$+3 \quad +3 \quad -1 \quad -1$

$x = 3$ $\quad \frac{2x}{2} = \frac{-1}{2}$

$x = -\frac{1}{2}$

3) $x^3 + 13x = 10x^2$

$-10x^2 \quad -10x^2$

$x^3 - 10x^2 + 13x = 0$

factor

Factored form: $x(x^2 - 10x + 13) = 0$

$x = 0$ or $1x^2 - 10x + 13 = 0$

Not factorable... so use Quadratic formula ☺

$a = 1, \; b = -10, \; c = 13$

$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(13)}}{2(1)}$

$= \frac{10 \pm \sqrt{100 - 52}}{2}$

$= \frac{10 \pm \sqrt{48}}{2}$

$\sqrt{48}$, $\sqrt{16}\sqrt{3}$, $4\sqrt{3}$

$= \frac{10 \pm 4\sqrt{3}}{2} = \frac{10}{2} \pm \frac{4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$

≈ 8.5

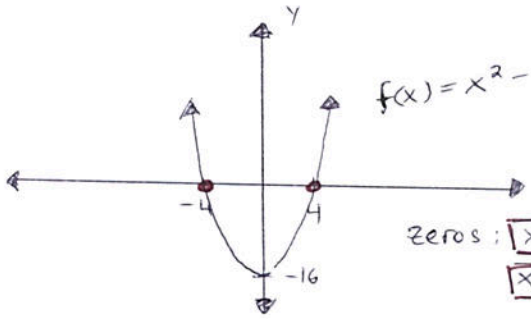
$\therefore x = 5 + 2\sqrt{3}$ or $x = 5 - 2\sqrt{3}$

≈ 1.5

Notes

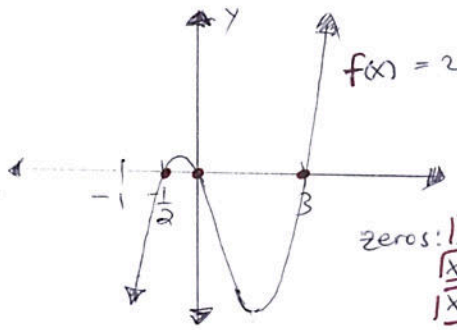
- To solve algebraically, set the polynomial equal to zero.

Now, to solve graphically use Nspire:



Zeros: $x = -4$ or $x = 4$

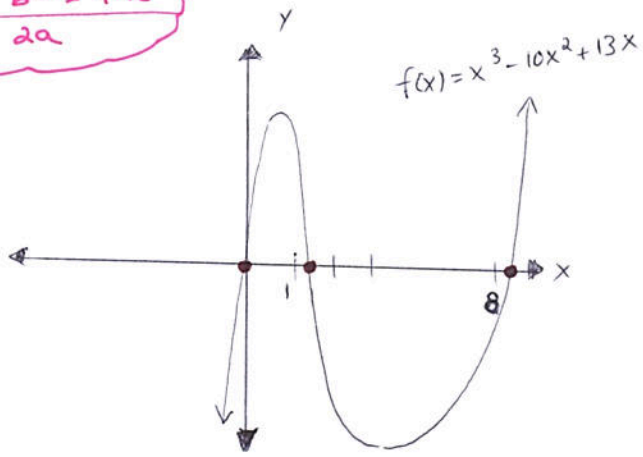
Now, Graphically:



Zeros: $x = -0.5$ or $x = 0$ or $x = 3$

Now, Graphically:

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$



Zeros: $x = 0$

$x \approx 1.5$

$x \approx 8.5$

} Approximately to nearest tenth

You try it!

Answers:

4) $x^2 - 2x = -7x + 24$

$x = -8$ or $x = 3$

5) $x^3 = 8x - 2x^2$

$x = -4$ or $x = 0$ or $x = 2$

6) $x^3 + 6x = 6x^2$

$x = 0$ or $x = 3 + \sqrt{3}$ or $x = 3 - \sqrt{3}$

7) $3x^4 + 12x^2 = 6x^3$ (Challenge)

$x = 0$ or $x = 1 + i\sqrt{3}$ or $x = 1 - i\sqrt{3}$

$x = 0$: repeated zero

$x = 1 + i\sqrt{3}$ or $x = 1 - i\sqrt{3}$: complex solutions