Chapter 2
Section 5

Zeros of a Polynomial Function

Fundamental Theorem of Algebra

If $f(x)$ is a polynomial of degree n, where $n > 0$, the function has precisely n linear factors

Rational Zeros test

- If the polynomial $f(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_2 x^2 + a_1 x + a_0$ has integer coefficients, every rational zero of F(x) has the form: $$RationalZero = \frac{p}{q}$$

Where p and q have no common factors other than 1, and

p = a factor of the constant term a_0

q = a factor of the leading coefficient a_n

Examples: Find p and q

- 1. $1x^4 - x^3 + x^2 - 3x - 6$

p: $\pm1, \pm2, \pm3, \pm6$

q: ±1

p/q: $\pm1, \pm2, \pm3, \pm6$

- 2. $x^5 - 2x^3 + 10x^2 + 8$

p: $\pm1, \pm2, \pm4, \pm8$

q: ±1

p/q: $\pm1, \pm2, \pm4, \pm8$

- 3.) $2x^3 + 3x^2 - 8x + 3$

p: $\pm1, \pm3$

q: $\pm1, \pm2$

p/q: $\pm1, \pm3, \pm\frac{1}{2}, \pm\frac{3}{2}$

- 4.) $3x^3 + 5x - 10$

p: $\pm1, \pm2, \pm5, \pm10$

q: $\pm1, \pm3$

p/q: $\pm1, \pm2, \pm5, \pm10, \pm\frac{1}{3}, \pm 2/$

2 | 1

Examples- solve and simplify

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

$p: \pm 1, \pm 2, \pm 3, \pm 6$

$q: \pm 1$

$p/q: \pm 1, \pm 2, \pm 3, \pm 6$

-1	1	-1	1	-3	-6
		-1	2	-3	6
	1	-2	3	-6	0

$x^3 - 2x^2 + 3x - 6$

$(x^3 - 2x^2) + (3x - 6)$

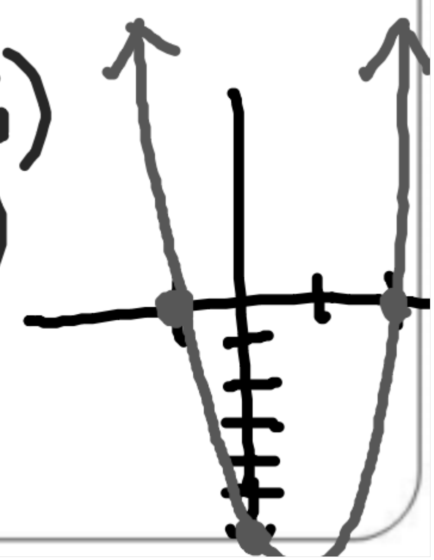
$x^2(x-2) + 3(x-2)$

$(x^2+3)(x-2)$

2	1	-2	3	-6
		2	0	6
	1	0	3	0

$x^2 + 3 = 0$ → $x = \pm i\sqrt{3}$

$x = 2$



Examples- solve and simplify

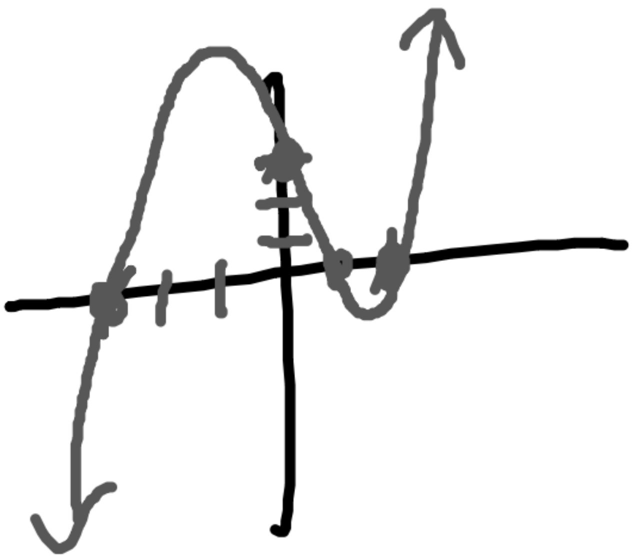
$$y = 2x^3 + 3x^2 - 8x + 3$$

$p: \pm 1, \pm 3$

$q: \pm 1, \pm 2$

$p/q: \pm 1, \pm 3, \pm 1/2, \pm 3/2$

-3	2	3	-8	3
		-6	9	-3
	2	-3	1	0



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

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

$$\left(x - \frac{2}{2}\right)\left(x - \frac{1}{2}\right)$$

$$(x-1)(2x-1)$$

$x = 1$ $\quad$ $x = 1/2$

Homework

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