Note Title 11/13/2015

roots zeros solutions

Synthetic divison - Remainder 0 !

Quadratic : factor, quadratic formula

* Decartes rule of signs

* Rational Zero theorem

Descartes Rule of Signs · Rational Zero Theorem

Note Title 4/3/2009

Objective: To 1) determine the number and type of roots for a polynomial equation, 2) determine possible rational roots for a polynomial equation, and 3) find the zeros (roots) of a polynomial equation.

Ex 1: Determine the number and type of roots.

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

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

$1 \quad 1 \quad 1$

$f(\ ) = \ \ - 4x^2 \ \ - 4$

$- \quad - \quad - \quad -$

"or less than this by an even number"

subtract 2.

+	−	i
3	0	0 *
1	0	2 *

3 roots

Ex2: $f(x) = x^3 - x^2 + 2x + 4$

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

1 1

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

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

1

+	-	i
2	1	0
0	1	2

3 roots

imagiary #'s

come in pairs

Ex3:

$$f(x) = x^{5} - 6x^{4} - 3x^{3} + 7x^{2} - 8x + 1$$

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

$$1 \qquad\qquad 1 \qquad 1 \qquad 1$$

$$f(-x) = -x^{5} - 6x^{4} + 3x^{3} + 7x^{2} + 8x + 1$$

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

1

+	−	i
	1	
	1	
	1	

5 roots

What if . . .

+	-	i
3	2	

Ex 4:

$$f(x) = \underset{q}{1}x^3 - 3x^2 + 4x - \underset{p}{\boxed{12}}$$

Rational Zero Theorem

$p = 12 : \pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

$q = 1 : \pm 1$

$\dfrac{p}{q} = \quad = \pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

+	−	i
3	0	0
1	0	2

$f(-x) =$ _ _ _ _

$f(x) = \overset{q}{3}x^4 - x^3 + \overset{p}{4}$ $\qquad f(-x) = 3x^4 + x^3 + 4$

$+ \quad - \quad +$ $\qquad + \quad + \quad +$

4 roots

+	-	i
2	0	2
0	0	4

$p = 4 : \pm 1, \pm 2, \pm 4$

$q = 3 : \pm 1, \pm 3$

$\frac{p}{q} = \pm 1, \pm \frac{1}{3}, \pm 2, \pm \frac{2}{3}, \pm 4, \pm \frac{4}{3}$

You try...

$$f(x) = x^4 + x^3 - 19x^2 + 11x + 30$$

p 376 (19 - 24) all

+	−	i

p 381 (13 - 17) odd $\frac{p}{q}$

p 381 (7 , , 24) everything