LT23: I can find all the roots of a polynomial using graphing, Rational Root Theorem, and/or Descartes' Rule of Signs.

4.4 - Rational Root Theorem (RRT)

$$3x^3 - 13x^2 + 2x + 8 = 0$$

$p: \pm 1, \pm 2, \pm 4, \pm 8$

$q: \pm 1, \pm 3$

$\frac{p}{q}: \pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{8}{3}$

Descartes' Rule of signs - used to determine the possibilities for the number of (+) real, (-) real and imaginary roots.

- States that the number of (+) real zeros is the same as the number of changes in sign of the coefficients or is less than this by an even number.

- States that the number of (-) real zeros is the same as the number of changes in sign of the coefficiens of the terms P(-x), or less than this by an even number.

$$f(x) = 3x^3 - 13x^2 + 2x + 8$$

3 -13 2 8

Y Y N

2 sign changes, so there are 2 or 0 (+) real roots.

$$f(-x) = 3(-x)^3 - 13(-x)^2 + 2(-x) + 8$$

$$-3x^3 - 13x^2 - 2x + 8$$

N N Y

1 change, so there is one negative zero.

r				
	3	-13	2	8
1	3	-10	-8	0 ← root/zero
-1	3	-16	18	-10
2				
-2				