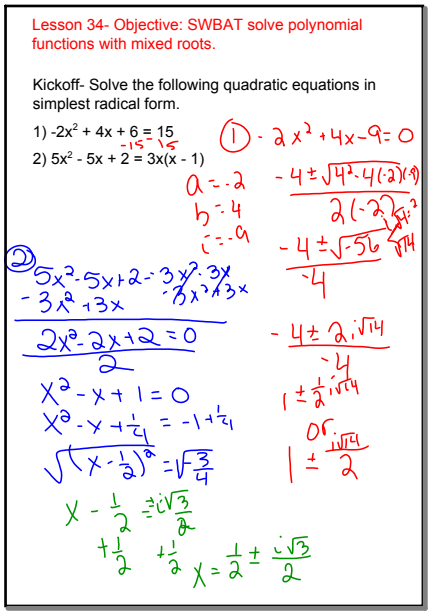
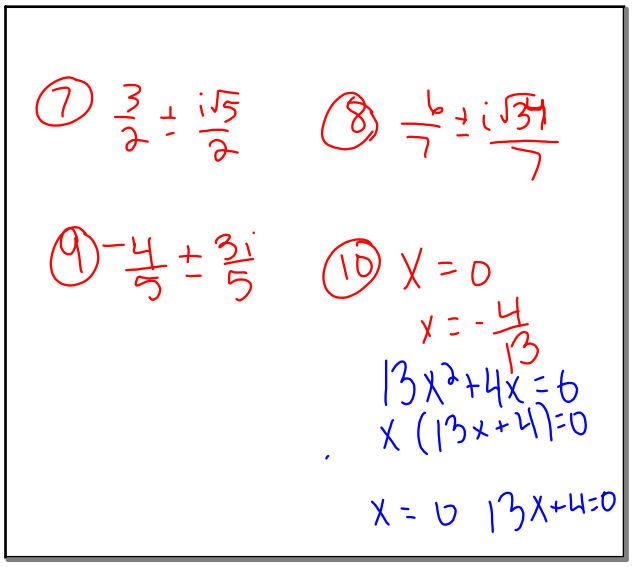
Lesson 34- Objective: SWBAT solve polynomial functions with mixed roots.

Kickoff- Solve the following quadratic equations in simplest radical form.

1) $-2x^2 + 4x + 6 = 15$

2) $5x^2 - 5x + 2 = 3x(x - 1)$





Solving Polynomial Functions with Mixed Roots

Try This: Find all possible rational zeros.

$f(x) = 3x^3 - 4x^2 + x + 15$

$\pm15, \pm5, \pm3, \pm1$

$\pm3, \pm1$

$\pm15, \pm5, \pm3, \pm1, \pm\frac{5}{3}, \pm\frac{1}{3}$

Solving Polynomial Functions with Mixed Roots

1) Find the possible rational zeros
2) Use calculator to find a possible zero.
3) Use the Factor Theorem to find the zero.
4) Synthetically Divide to break down the polynomial function
5) Keep doing these steps until you have a quadratic!
6) Once you get a quadratic solve using:

Quadratic Formula
Factoring/Box
Complete the Square

Directions: Find the zeros of the polynomial function.

Ex1: $f(x) = x^3 - 8x^2 - 51x - 62$

$\pm62, \pm31, \pm2, \pm1$

±1

Possible Zeros
$\pm62, \pm31$
$\pm2, \pm1$

$f(-2)=0$

	1	−8	−51	−62
−2		−2	20	62
	1	−10	−31	0

$f(x)=(x+2)(x^2-10x-31)=0$

$x+2=0$ $x^2-10x-31=0$

$x=-2$ $x^2-10x+25=31+25$

$\sqrt{(x-5)^2}=\sqrt{56}$

$x-5=\pm2\sqrt{14}$

$+5\quad+5$

$x=5\pm2\sqrt{14}$

Zeros

$\{-2, 5+2\sqrt{14}, 5-2\sqrt{14}\}$

Ex2: $f(x) = 9x^4 + 9x^3 + 18x^2 - 90x - 108$

$\pm108, \pm54, \pm36, \pm27, \pm18, \pm12, \pm9, \pm6, \pm4, \pm3, \pm2, \pm1$

$\pm9, \pm3, \pm1$

Possible zeros

$\pm108, \pm54, \pm36, \pm27, \pm18, \pm12, \pm9, \pm6, \pm4, \pm3, \pm2, \pm1, \pm\frac{4}{3}, \pm\frac{2}{3}, \pm\frac{4}{9}, \pm\frac{1}{3}, \pm\frac{2}{9}, \pm\frac{1}{9},$

$f(-1)=0$

$f(2)=0$

	9	9	18	−90	−108
−1		−9	0	−18	108
	9	0	18	−108	0
2		18	36	108	
	9	18	54	0	

$f(x)=(x+1)(x-2)(9x^2+18x+54)=0$

$x=-1$ $x=2$ $9x^2+18x+54=0$

9

$x^2+2x+6=0$

Zeros

$\{-1, 2, -1+i\sqrt{5}, -1-i\sqrt{5}\}$

$x^2+2x+1=-6+1$

$\sqrt{(x+1)^2}=\sqrt{-5}$

$x+1=\pm i\sqrt{5}$

$x=-1\pm i\sqrt{5}$

Practice:

1) $f(x) = x^4 - 16$

2) $h(x) = x^4 - x^3 - 9x^2 - 3x - 36$

3) $g(x) = x^4 - 4x^3 + 8x^2 - 8x$

4) $j(x) = x^4 - 6x^3 - 11x^2 + 86x - 120$

5) $f(x) = x^5 - 8x^4 + 87x^3 - 284x^2 + 268x$