2.5 Continued:

$f(x) = 3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16$

write the linear factorization (find zeros) & write as a product of linear & irreducible quadratic factors.

$\frac{p}{q} = \frac{\pm 1, 2, 4, 8, 16}{\pm 1, 3}$

graph looks like: $\frac{2}{3}$, $(x - \frac{2}{3})$

$\frac{2}{3}$	3	-2	6	-4	-24	16
	↓	2	0	4	0	-16
	$3x^4$	$0x^3$	$6x^2$	$0x$	-24	0

$(x - \frac{2}{3})(3x^4 + 6x^2 - 24)$

$(x - \frac{2}{3})(3)(x^4 + 2x^2 - 8)$

$(x - \frac{2}{3})(3)(x^2 + 4)(x^2 - 2)$

$(3x - 2)$ not lin. not lin.

$x = \frac{2}{3}$

$x^2 + 4 = 0$

$-4 \quad -4$

$\sqrt{x^2} = \sqrt{-4}$

$x = i\sqrt{-4}$

$x = \pm 2i$

$\sqrt{x^2} - 2 = 0$

$+2 \quad +2$

$x = \pm\sqrt{2}$

linear factorization $(3x - 2)(x - 2i)(x + 2i)(x + \sqrt{2})(x - \sqrt{2})$

product of linear & irreducible (not imaginary) quadratic factors:

$(3x - 2)(x^2 + 4)(x + \sqrt{2})(x - \sqrt{2})$

Oct 19-9:07 AM

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

* Linear Factorization

* product of Linear & Irreducible Quadratic Factors

zeros: $\frac{p}{q} = \frac{\pm 1, 2, 3, 6}{\pm 1}$ looks like: 2

$$\begin{array}{r|cccc} 2 & 1 & -1 & 1 & -6 \\ & \downarrow & 2 & 2 & 6 \\ \hline & 1 & 1 & 3 & 0 \end{array}$$

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

$x = \frac{-1 \pm \sqrt{1-4(1)(3)}}{2}$

$= \frac{-1 \pm i\sqrt{11}}{2}$

$(x-2)\left(x-\left(\frac{-1+i\sqrt{11}}{2}\right)\right)\left(x-\left(\frac{-1-i\sqrt{11}}{2}\right)\right)$

36. $f(x) = x^4 - 2x^3 + 5x^2 + 10x - 50$ (4 zeros)

$1 + 3i$

$1 - 3i$

$(x - 1 + 3i)(x - 1 - 3i) = x^2 - x - 3ix - x + 1 + 3i + 3ix - 3i - 9i^2$

$-9i^2 = +9$

$f(x) = (x^2 - 2x + 10)(x^2 - 5)$

$x^2 - 2x + 10 \overline{)\, x^4 - 2x^3 + 5x^2 + 10x - 50}$

$x^2 - 5$

$-(x^4 - 2x^3 + 10x^2)$

$-5x^2 + 10x - 50$

$-(-5x^2 + 10x - 50)$

0

$x^2 - 5 = 0$

$x = \pm\sqrt{5}$

$x^2 - 5$

$(x - (1 - 3i))(x - (1 + 3i))$

$(x - 1 + 3i)(x - 1 - 3i)(x - \sqrt{5})(x + \sqrt{5})$

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

4 complex zeros

2 real zeros

30. $f(x)=3x^4+8x^3+6x^2+3x-2$

zeros: $\frac{p}{q}$ - $\frac{\pm 1, 2}{\pm 1, 3}$ looks like: -2 $\frac{1}{3}$

$f(x)=(x+2)(x-\frac{1}{3})(3x^2+3x+3)$

-2	3	8	6	3	-2
	↓	-6	-4	-4	2
$\frac{1}{3}$	3	2	2	-1	0
	↓	1	1	1	
	$3x^2$	$3x$	3	0	

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

$x=\frac{-3\pm\sqrt{9-4(3)(3)}}{6}=\frac{-3\pm\sqrt{-27}}{6}=\frac{-3\pm i\sqrt{27}}{6}$

$\frac{-3\pm 3i\sqrt{3}}{6}=\frac{-1\pm i\sqrt{3}}{2}$

$(x+2)(x-\frac{1}{3})\left(x-\left(\frac{-1+i\sqrt{3}}{2}\right)\right)\left(x-\left(\frac{-1-i\sqrt{3}}{2}\right)\right)$

4 zeros

35. $f(x) = x^4 - 6x^3 + 11x^2 + 12x - 26$

$3-2i$
$3+2i$

$(x-3-2i)(x-3+2i) = x^2 - 3x + 2ix - 3x + 9 - 6i - 2ix + 4i$

$-4i^2$
$+4$

$= x^2 - 6x + 13$

$$x^2-6x+13 \overline{)\, x^4 - 6x^3 + 11x^2 + 12x - 26}$$

x^2

$-(x^4 - 6x^3 + 13x^2)$ ↓ ↓

$-2x^2 + 12x - 26$

$-(-2x^2 + 12x - 26)$

0

$\sqrt{x^2} - 2 = 0$
$+2 \quad +2$
$\sqrt{} \quad \pm\sqrt{2}$

$x = \pm\sqrt{2}$

$(x-3-2i)(x-3+2i)(x-\sqrt{2})(x+\sqrt{2})$