Today's Plan:

Learning Target (standard): I will use the remainder theorem and factor to theorem to locate zeros of polynomials. I will use the zeros to factor the ploynomial.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

44) $f(x)=(x+1)(x+2)(x-2)^2$

zeros: x = -1,-2,2

46) $f(x)=(x+3)\left(\sqrt{2}x+1\right)\left(\sqrt{2}x-1\right)\left(2x^2+1\right)$

zeros: $x = -3, \sqrt{2}/2, -\sqrt{2}/2$

48) $2(2x+3)(x^2+1)=0$

$x = -3/2$

QUIZ Monday

50) $2(2x-5)(x^2+x+1)=0$

$x = 5/2$

52) $(x-2)(2x+1)(x-4)=0$

$x = 2, -1/2, 4$

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

$x = 1$

56) $(2x-1)(x^2+2x+4)=0$ $x = 1/2$

$2x^2-1$

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

$4x^2-1$

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

$2x^2=1$

$\sqrt{x^2}=\pm\sqrt{\frac{1}{2}}$

$x=\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}$

$3x^2-2$

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

$2\left(x^3+\frac{3}{2}x^2+3x-2=0\right)$

$2x^3+3x^2+6x-4=0$ MNZ: 3

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

$q: \pm1, \pm2$

$\frac{p}{q}: \pm1, \pm\frac{1}{2}, \pm2, \pm4$

$$\begin{array}{c|cccc} \frac{1}{2} & 2 & 3 & 6 & -4 \\ & & 1 & 2 & 4 \\ \hline & 2 & 4 & 8 & 0 \end{array}$$

$(2x-1)(2x^2+4x+8)=0$

$2(2x-1)(x^2+2x+4)=0$

$x^2+2x+1=-4+1$

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

not real

$2(2x-1)(x^2+2x+4)=0$

zeros: $x=\frac{1}{2}$

Solve by taking square roots:

$$\left(u+\frac{5}{6}\right)^2+27=0$$

$$\sqrt{\left(u+\frac{5}{6}\right)^2}=\pm\sqrt{-27}$$

$$u+\frac{5}{6}=3\sqrt{3}\,i,\ -3\sqrt{3}\,i$$

$$u=-\frac{5}{6}+3\sqrt{3}\,i,\ -\frac{5}{6}-3\sqrt{3}\,i$$

Solve by completing the square.

$$3u^2=6u+1$$

$$\frac{3u^2}{3}-\frac{6u}{3}=\frac{1}{3}$$

$$u^2-2u+1=\frac{1}{3}+1$$

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

$$u-1=\frac{2}{\sqrt{3}},\ \frac{-2}{\sqrt{3}}$$

$$\frac{2}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{2\sqrt{3}}{3}$$

$$u-1=\frac{2\sqrt{3}}{3},\ \frac{-2\sqrt{3}}{3}$$

$$u=1+\frac{2\sqrt{3}}{3},\ 1-\frac{2\sqrt{3}}{3}$$

$$u=\frac{3+2\sqrt{3}}{3},\ \frac{3-2\sqrt{3}}{3}$$

Solve using the quadratic formula.

$$3x^2+10x+6=0$$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-10\pm\sqrt{100-4(3)(6)}}{2(3)}$$

$$=\frac{-10\pm\sqrt{100-72}}{6}$$

$$=\frac{-10\pm\sqrt{28}}{6}$$

$$=\frac{-10\pm2\sqrt{7}}{6}$$

$$\boxed{x=\frac{-5+\sqrt{7}}{3},\ \frac{-5-\sqrt{7}}{3}}$$

Solve by factoring.

$$8k^2-42k=k^2$$

$$7k^2-42k=0$$

$$7k(k-6)=0$$

$$\boxed{k=0,6}$$

Solve by taking square roots.

$$6n^2 - 10 = -28$$

$$6n^2 = -18$$

$$\sqrt{n^2} = \pm\sqrt{-3}$$

$$n = \sqrt{3}\,i, -\sqrt{3}\,i$$

State the possible number of real zeros and the possible rational zeros. Use these to completely factor the function and find ALL zeros.

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

MNZ: 3

p: ± 1

q: $\pm 1, \pm 3$

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

$$f(x) = x^2(3x-1) - 1(3x-1)$$

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

$$f(x) = (3x-1)(x+1)(x-1)$$

zeros: $x = -1, \frac{1}{3}, 1$

Find the real zeros & completely factor:

$$f(x) = 3x^5 - 2x^4 - 15x^3 + 10x^2 + 12x - 8$$

MNZ: 5

p: ±1, ±2, ±4, ±8

q: ±1, ±3

$\frac{p}{q}$: $\pm1, \pm\frac{1}{3}, \pm2, \pm\frac{2}{3}, \pm4, \pm\frac{4}{3}, \pm8, \pm\frac{8}{3}$

$$\begin{array}{r|rrrrrr} 1 & 3 & -2 & -15 & 10 & 12 & -8 \\ & & 3 & 1 & -14 & -4 & 8 \\ \hline & 3 & 1 & -14 & -4 & 8 & 0 \end{array}$$

$f(x) = (x-1)(3x^4 + x^3 - 14x^2 - 4x + 8)$

$$\begin{array}{r|rrrrr} -1 & 3 & 1 & -14 & -4 & 8 \\ & & -3 & 2 & 12 & -8 \\ \hline & 3 & -2 & -12 & 8 & 0 \end{array}$$

$f(x) = (x-1)(x+1)(3x^3 - 2x^2 - 12x + 8)$

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

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

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

$$\boxed{\begin{gathered} f(x) = (x-1)(x+1)(3x-2)(x+2)(x-2) \\ \text{zeros: } x = 1, -1, \tfrac{2}{3}, -2, 2 \end{gathered}}$$

Solve & completely factor:

$$2\left(\frac{1}{2}x^4 - \frac{1}{2}x^3 + x^2 - 2x - 4 = 0\right)$$

$x^4 - x^3 + 2x^2 - 4x - 8 = 0$

MNZ: 4

p: ±1, ±2, ±4, ±8

q: ±1

$\frac{p}{q}$: ±1, ±2, ±4, ±8

$$\begin{array}{r|rrrrr} -1 & 1 & -1 & 2 & -4 & -8 \\ & & -1 & 2 & -4 & 8 \\ \hline & 1 & -2 & 4 & -8 & 0 \end{array}$$

$(x+1)(x^3 - 2x^2 + 4x - 8) = 0$

$(x+1)[x^2(x-2) + 4(x-2)] = 0$

$(x+1)(x-2)(x^2+4) = 0$

$x^2 + 4 = 0$

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

$x = 2i, -2i$

$(x+1)(x-2)(x+2i)(x-2i) = 0$

$x = -1, 2, -2i, 2i$

Solve & completely factor:

$$3x^3+4x^2-7x+2=0$$

MNZ: 3

p: $\pm1, \pm2$

q: $\pm1, \pm3$

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

$$\begin{array}{c|cccc} \frac{2}{3} & 3 & 4 & -7 & 2 \\ & & 2 & 4 & -2 \\ \hline & 3 & 6 & -3 & 0 \end{array}$$

$(3x-2)(3x^2+6x-3)=0$

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

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

$x^2+2x+1=1+1$

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

$x+1=\sqrt{2}, -\sqrt{2}$

$x=-1+\sqrt{2}, -1-\sqrt{2}$

$3(3x-2)(x+1+\sqrt{2})(x+1-\sqrt{2})=0$

$x=\frac{2}{3}, -1-\sqrt{2}, -1+\sqrt{2}$

$f(x)=6x^5+2x^4+3x^3+x^2-18x-6$

MNZ: 5

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

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

$\frac{p}{q}: \pm1, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm\frac{1}{6}, \pm2, \pm\frac{2}{3}, \pm3, \pm\frac{3}{2}, \pm6$

$$\begin{array}{c|cccccc} -\frac{1}{3} & 6 & 2 & 3 & 1 & -18 & -6 \\ & & -2 & 0 & -1 & 0 & 6 \\ \hline & 6 & 0 & 3 & 0 & -18 & 0 \end{array}$$

$f(x)=(3x+1)(6x^4+3x^2-18)$

$f(x)=3(3x+1)(2x^4+x^2-6)$

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

$\sqrt{2}x+\sqrt{3}=0$

$\sqrt{2}x=-\sqrt{3}$

$x=-\frac{\sqrt{3}}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}$

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

Zeros: $x=-\frac{1}{3}, -\frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}$

Assignment:

Real Zeros of Polynomials

#1-10