

3-4 Homework examples.

~~Find all real zeros of the polynomial.~~

List all possible Rational zeros.

$$1) f(x) = \underbrace{6x^4 - x^2 + 2x + 12}_{p}$$

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

factors of P  
factors of q

List will always contain all factors of P. If q is 1 then list is just factors of P.

List before reducing fractions.

$$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \frac{1}{2}, \frac{2}{2}, \frac{3}{2}, \frac{4}{2}, \frac{6}{2}, \frac{12}{2}$$

Do not include ~~Repeats~~ Repeats.

So final list

$$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{1}{6}$$

note: I did not include #'s

like  $\frac{2}{6}$

or  $\frac{4}{6}$  because  $\frac{2}{6} = \frac{1}{3}$  } already on the list.  
 $\frac{4}{6} = \frac{2}{3}$  }



3) Find all Real zeros of the Polynomial # 7 from H.w.

$$P(x) = x^4 + 6x^3 + 7x^2 - 6x - 8$$

List of Rational Zeros:

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

Try,

<u>2</u>	1	6	7	-6	-8	
	↓					
	1	8	23	40	+72	not equal to zero so 2 is not a zero of the Polynomial.

now TRY,

<u>1</u>	1	6	7	-6	-8	
	↓					
	1	7	14	8	0	1 is a zero and $(x-1)$ is a factor of $P(x)$

  

<u>-2</u>	1	7	14	8	0	
	↓					
	1	-2	-10	-8	0	Repeat Process. -2 is a zero and $(x+2)$ is a factor.

now

$$x^2 + 5x + 4 = 0 \text{ (factor)}$$

$$(x+4)(x+1) = 0$$

$$\begin{array}{r} 4 \\ \times 1 \\ \hline 4 \end{array}$$

So,

$P(x) = (x+4)(x+1)(x-1)(x+2)$   
 with zeros; 1, -2, -1, -4

4) Find all Real zeros of the Polynomial. (#12 ~~HW~~ H.W.)

$$p(x) = 6x^3 + 8x^2 - 5x - 7$$

List of Rational zeros

$$\pm 1, \pm 7, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm \frac{7}{2}, \pm \frac{7}{3}, \pm \frac{7}{6}$$

Please note for example purpose I am picking the correct zero to start. You may have to use trial and error to find the first root.

$$\begin{array}{r|rrrr} -1 & 6 & 8 & -5 & -7 \\ & \downarrow & -6 & -2 & 7 \\ \hline & 6 & 2 & -7 & 0 \end{array}$$

now

$$\underbrace{6x^2}_{a} + \underbrace{2x}_{b} - \underbrace{7}_{c} = 0$$

$$\frac{-2 \pm \sqrt{2^2 - 4(6)(-7)}}{2(6)}$$

~~use~~ factor if possible.

I am going to use quad. formula to start because it always works.

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

$$\frac{-2 \pm \sqrt{4 + 168}}{12}$$

$$= \frac{-2 + \sqrt{172}}{12}$$

$$\frac{-2 + 2\sqrt{43}}{12}$$

$$\frac{-1 + \sqrt{43}}{6}$$

$$\frac{-2 - \sqrt{172}}{12}$$

$$\frac{-2 - 2\sqrt{43}}{12}$$

$$\frac{-1 - \sqrt{43}}{6}$$