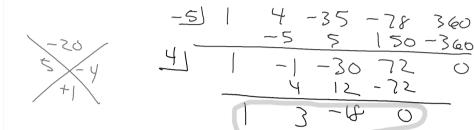
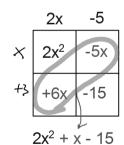
How could you use Synthetic Division to find the following quotient?

$$\frac{x^4 + 4x^3 - 35x^2 - 78x + 360}{x^2 + x - 20} = \begin{cases} x^2 + 3x - 18 \\ (x + 5)(x - 4) \end{cases}$$



Using the "Box" for Polynomial Division

Expand using the Box: (x+3)(2x-5)



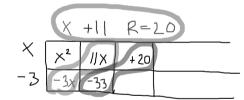
$$x + 4$$
 $x^{2} + 9x + 20$
 $(x+4)()=x^{2} + 9x + 20$
 $x + 5$
 $x + 5$
 $x + 5$
 $x + 6$
 $x + 7$
 x

these have to add up to +9x these have to add up to 20 0 is the remainder

How could you use Synthetic Division to find the following quotient?

Find this quotient using using "the Box"

$$\frac{x^2 + 8x - 13}{x - 3}$$



These two spaces have to add to +8x

These two spaces have to add to -13

Find this quotient using Polynomial Long Division or using "the Box"

3x - 2
$$12x^3 - 5x^2 - 17x + 8$$

 $-12x^3 - 5x^2$
 $-17x$
 $-3x^2 - 17x$
 $-15x + 10$
 $-15x + 10$
 $-15x + 10$
 $-15x + 10$

$$3x |_{12x^{3}} |_{3x^{2}} |_{-15x} |_{-2}$$

$$-2 |_{8x^{3}} |_{-2x} |_{+10}$$

These two spaces have to add to $-5x^2$

These two spaces have to add to -17x

These two spaces have to add to +8

Sec 6-5: Theorems About Roots of Polynomial Equations.

Theorem

Rational Root Theorem

If $\frac{p}{q}$ is in simplest form and is a rational root of the polynomial equation $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ with integer coefficients, then p must be a factor of a_0 and q must be a factor of a_n .

Find this quotient: $\frac{4x^3 + 7x - 9}{x + 3}$

$$\frac{-3}{4} \frac{407}{-1236} - 9$$

$$\frac{-1236}{4} - 129$$

$$\frac{-1243}{-136} - 136$$

$$\frac{4x^{2}-12x+43}{2x+43} = -136$$

Theorem

Rational Root Theorem

If $\frac{p}{q}$ is in simplest form and is a rational root of the polynomial equation $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ with integer coefficients, then p must be a factor of a_0 and q must be a factor of a_n .

What this says is that if a polynomial has any rational roots then they will be amongst the list of roots found by doing the following:

Factors of the constant

Factors of the leading coefficient

State the possible rational roots of this polynomial then find all roots. $x^3 + 2x^2 - 5x - 6$

$$=\pm1$$
) ±2 , ±3 , ±6

Since f(-1)=0, -1 is a zero. Now I can do division to find the other zeros:

Since x-2 and x+3 are factors the other two zeros are: 2 and -3

You can now finish Hwk #32 Sec 6-5

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Problems 1-5, 32-34

State the possible rational roots of this polynomial then find all roots. $2x^3 + 7x^2 + 2x - 3$

$$\frac{\pm 1}{1}$$
, ± 3
 $\frac{\pm 1}{1}$, ± 2
 ± 1 , ± 2
 ± 1 , ± 3
 ± 1 , ± 3

Since f(-1)=0, -1 is a root. Now I can use division on the original polynomial:

Since x+3 and 2x-1 are factors the other two roots are: $-\frac{3}{5} + \frac{1}{2}$