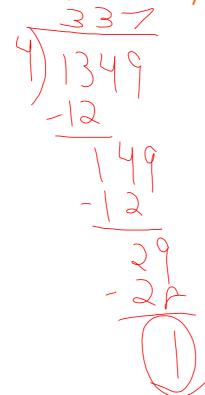
What's the remainder? (no calculator)

When 12 is divided by 5?

When 27 is divided by 3?

When 1349 is divided by 4?



2.3 Finding the Other Zeros of Polynomials

If you know a zero of a polynomial, then you know a factor of the polynomial.

If you have a factor, you can use division to find the other zeros.

If f(x) and d(x) are polynomials such that d(x) does not equal 0 and the degree of $d(x) \le degree$ of f(x)

there exist unique polynomials q(x) and r(x) such that:

$$\int_{0}^{\infty} \int_{0}^{\infty} \int_{0}^{\infty} dx + \int_{0}^{\infty}$$

dividend = (divisor)(quotient) + remainder

Where r(x) = 0 or the degree of r(x) < degree of d(x).

If the remainder r(x) = 0, then d(x) and q(x) are factors of f(x)

Use long division only when you have to. $4 \times ^{7} - 7 \times ^{2} - 11 \times +5 = (4 \times +5)(x^{2} - 3 \times +1)$

$$\begin{array}{c} (2x-x^{2}-3x+1) \\ x+5) & (4x^{3}-7x^{2}-1)x+5 \\ & -(4x^{3}+5x^{2}) \\ & -12x^{2}-11x+5 \end{array}$$

$$\frac{-17x}{4x+5}$$

There is a quicker way to divide IF you are dividing by a function (x-k)

of the form

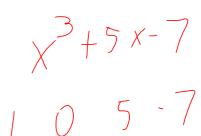
$$p(x) = ax^3 + bx^2 + cx + d$$
 $d(x) = x - k$

 $\frac{p(x)}{d(x)}$ can be done using <u>synthetic division</u> (

(must use place holders)

|k| abcd





$$\frac{5x^{3} + 18x^{2} + 7x - 6}{x + 3} = (x + 3)(5 + 3x + 2) \quad q(x) = 5x^{2} + 3x - 2$$

$$\frac{5(-3)^{2} + 18(-3)^{2} + 3x - 2}{x + 3}$$

$$\frac{5(-3)^{2} + 18(-3)^{2} + 3x - 2}{-135 + 162 - 27}$$

$$\frac{5x^{3} + 6x + 8}{x + 2}$$

$$\frac{5x^{3} + 6x + 8}{x + 2}$$

$$\frac{5}{5} = \frac{10}{20} = \frac{5}{20} = \frac{10}{20} = \frac{10}{20$$

Remainder Theorem: If a polynomial f(x) is divided by x - k, the remainder is r = f(k)

<u>Factor Theorem:</u> A polynomial f(x) has a factor (x - k), if and only if $f(k) = 0 = \sqrt{x}$

Given x + 3 is a factor of $f(x) = 3x^3 + 2x^2 - 19x + 6$

find all the zeros of f(x)

$$-\frac{3}{3}$$
 $\frac{3}{-9}$ $\frac{2}{21}$ $\frac{19}{-6}$ $\frac{6}{3}$ $\frac{3}{-7}$ $\frac{2}{2}$ $\frac{0}{2}$

Find all the factors of
$$f(x) = 4x^4 - 55x^2 - 45x + 36$$

 $f(x) = (x + 3)(4x^3/2x^2/9x + 12) = (x + 3)(x - 4)(x - 3)$

$$-\frac{3}{4} \frac{4}{-12} \frac{-19}{-12} \frac{1}{-19} \frac{1}{12}$$

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

$$210 = 2.105 = 2.5.21$$
Prime Factors $2.5.3.7$

$$\frac{210}{210} = 105$$
 $210 = 2.105$
 $210 = 2.5$