Polynomial Division

There are two methods used to divide polynomials. This first is a traditional long division method, and the second is synthetic division. Using either of these methods will yield the correct answer to a division problem. There are restrictions, however, as to when each can be used.

Synthetic division can only be used if the divisor is a first degree binomial.

For the division problem $\frac{x^3+4x^2-2x+1}{2x-1}$***, the divisor,*** $2x-1$***, is a first degree binomial, so you may use synthetic division.***

There are <u>no</u> restrictions as to when polynomial long division may be used. The polynomial long division method may be used at any time. If the divisor is a polynomial greater than first degree, polynomial long division <u>must</u> be used.

<u>The Division Algorithm</u>

When working with division problems, it will sometimes be necessary to write the solution using The Division Algorithm.

The Division Algorithm: $f_{(x)} = d_{(x)} \cdot q_{(x)} + r_{(x)}$

Simply put, the function = divisor · quotient + remainder

Is 12 divisible by 4?

Is 18 divisible by 3?

Is 15 divisible by 2?

Is 32 divisible by 8?

Based on your observations from the previous questions, what determines divisibility?

How can you determine whether or not the polynomial x^2-3x+2 **is a factor of** x^4+10x^2-4**?**

Find the quotient of each of the following. You may use synthetic or long division, but you need to know when to use each.

A) $\dfrac{6x^3-16x^2+17x-6}{3x-2}$

B) $\dfrac{3x^3-17x^2+15x-25}{x-5}$

C) $\dfrac{x^4+3x^2+1}{x^2-2x+3}$

D) $\dfrac{x^4-x^3-12x^2-2x+8}{x-4}$

E) $\dfrac{6x^3+10x^2+x+8}{2x^2+1}$

F) $\dfrac{x^3-1}{x-1}$

G) $\dfrac{x^5-4x^4+4x^3-13x^2+3x-1}{x^2+3}$

H) $\dfrac{2x^3+5x^2+2x+15}{2x^2-x+5}$

I) $\dfrac{3x^3-16x^2-72}{x-6}$

Is $x+2$ a factor of x^3+8?

Is $x-6$ a factor of $3x^3-16x^2-72$?