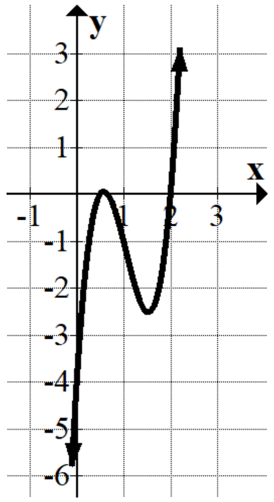
2.3A Notes Long Division

$f(x) = 6x^3 - 19x^2 + 16x - 4$



Notice that one of the zeros of f is $x = 2$. This means that $(x - 2)$ is a factor of $f(x)$ and there exists a second-degree polynomial $q(x)$ such that:

$f(x) = (x - 2) \cdot q(x)$

How do you find $q(x)$?

The Division Algorithm

If $f(x)$ and $d(x)$ are polynomials such that $d(x) \neq 0$, and the degree of $d(x)$ is less than or equal to the degree of $f(x)$, there exist unique polynomials $q(x)$ and $r(x)$ such that

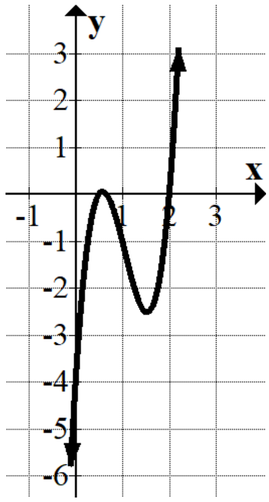
$$\underbrace{f(x)}_{\text{Dividend}} = \underbrace{d(x)}_{\text{Divisor}}\underbrace{q(x)}_{\text{Quotient}} + \underbrace{r(x)}_{\text{Remainder}}$$

where $r(x) = 0$ *or* the degree of $r(x)$ is less than the degree of $d(x)$. If the remainder $r(x)$ is zero, $d(x)$ *divides evenly* into $f(x)$.

Another way to write the division algorithm is:

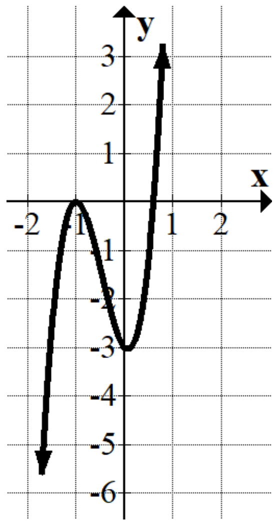
$$\frac{f(x)}{d(x)} = q(x) + \frac{r(x)}{d(x)}$$

$f(x) = 6x^3 - 19x^2 + 16x - 4$ $\qquad$ $d(x) = x - 2$



Find all of the zeros by long division.

$f(x) = 5x^3 + 7x^2 - x - 3$



Pull

Divide by long division:

$f(x) = x^3 - 1 \qquad d(x) = x - 1$

Divide by long division:

$f(x) = x^3 - 2x^2 - 9 \qquad d(x) = x - 3$

Divide by long division:

$f(x) = 2x^4 + 4x^3 - 5x^2 + 3x - 2 \qquad d(x) = x^2 + 2x - 3$

Write the function in the form $f(x) = (x - k)q(x) + r$ for the given value of k, and demonstrate that $f(k) = r$. (remainder theorem)

$f(x) = 15x^4 + 10x^3 - 6x^2 + 14$, $k = -2/3$

Write the function in the form $f(x) = (x - k)q(x) + r$ for the given value of k, and demonstrate that $f(k) = r$. (remainder theorem)

$f(x) = x^3 - x^2 - 10x + 7$, $k = -2/3$

Section 2.3 day 1

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