5.2 - Day 3 - Dividing Polynomials

Use synthetic division to divide $x^3 - 14x^2 + 51x - 54$ by $x + 2$. What is the quotient and remainder?

Step 1 Reverse the sign of +2. Write the coefficients of the polynomial.

$-2 \mid 1 \quad -14 \quad 51 \quad -54$

Step 2 Bring down the first coefficient.

$-2 \mid 1 \quad -14 \quad 51 \quad -54$

1

Step 3 Multiply the coefficient by the divisor. Add to the next coefficient.

$-2 \mid 1 \quad -14 \quad 51 \quad -54$

$\quad\quad\quad -2$

$1 \quad -16$

Step 4 Continue multiplying and adding through the last coefficient.

$-2 \mid 1 \quad -14 \quad 51 \quad -54$

$\quad\quad\quad -2 \quad 32 \quad -166$

$1 \quad -16 \quad 83 \quad -220$

The quotient is $x^2 - 16x + 83$, R -220.

Ex. 1

Use synthetic division to divide $(x^3 + 5x^2 - x - 9)$ by $(x + 2)$.

$-2 \mid 1 \quad 5 \quad -1 \quad -9$

$\quad\quad\quad -2 \quad -6 \quad 14$

$1 \quad 3 \quad -7 \mid 5$

remainder

$x^2 + 3x - 7$, R 5

The Factor Theorem

Let $f(x)$ be a polynomial.

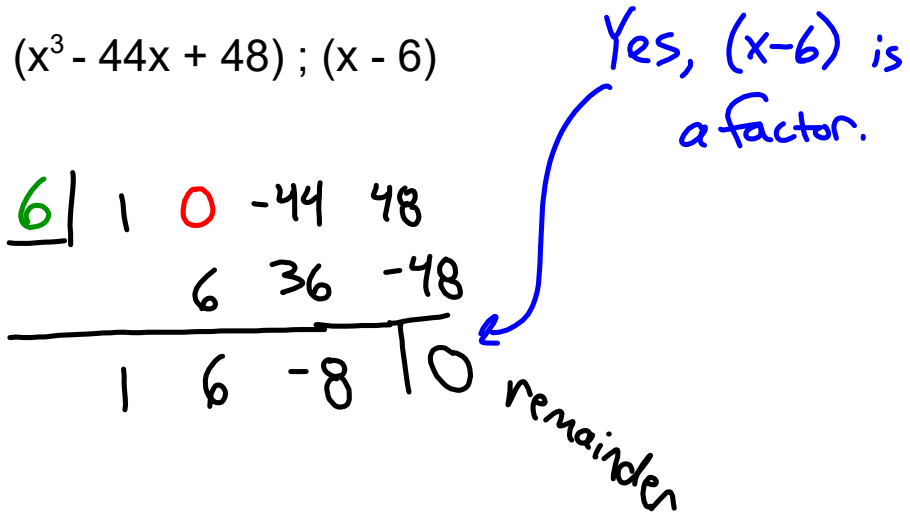
a. If $f(c) = 0$, then $x - c$ is a factor of $f(x)$.

b. If $x - c$ is a factor of $f(x)$, then $f(c) = 0$.

Ex. 2

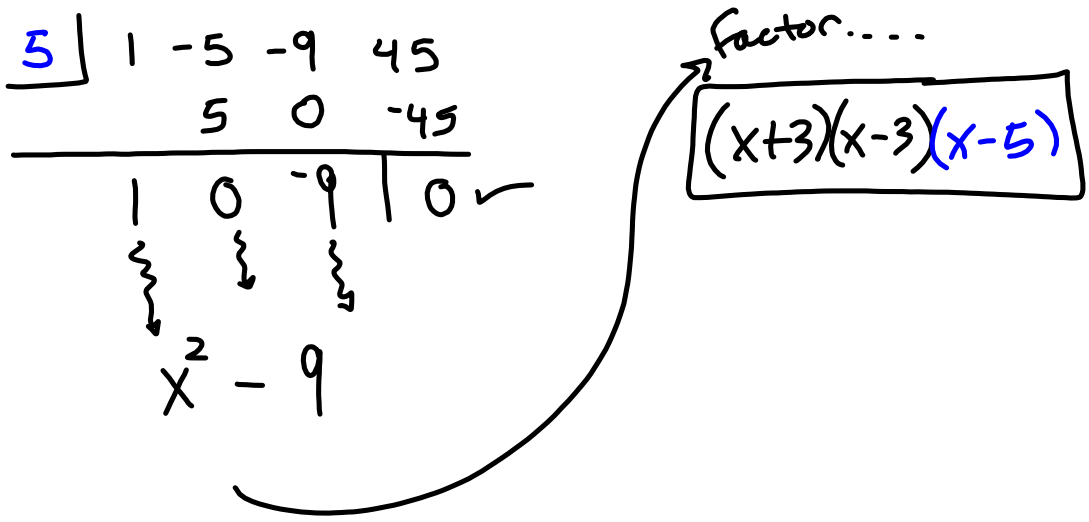
Use synthetic division to determine if the given binomial is a factor of the polynomial:

$(x^3 - 44x + 48)$; $(x - 6)$



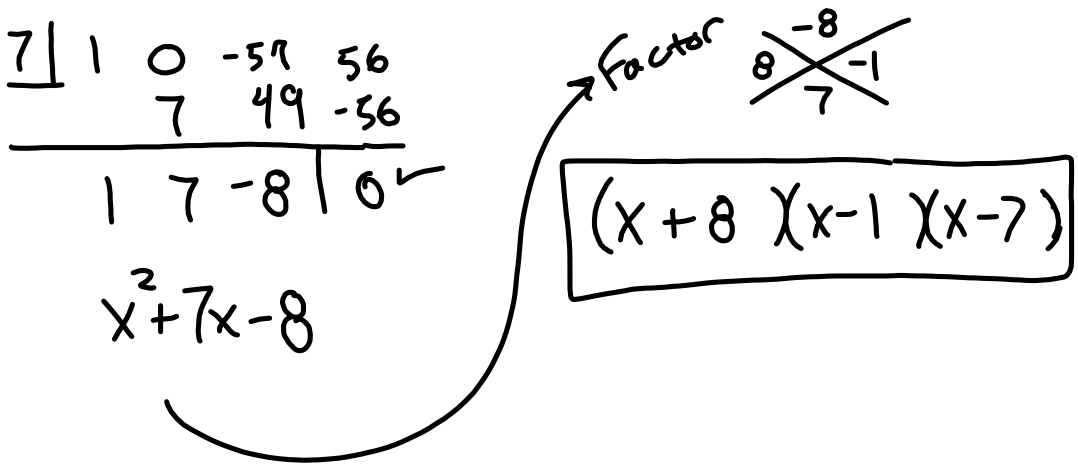
Ex. 3

Use synthetic division to divide $(x^3 - 5x^2 - 9x + 45)$ by $(x - 5)$. Then factor the quotient completely.



Ex. 4

Use synthetic division to divide $(x^3 - 57x + 56)$ by $(x - 7)$. Then factor the quotient completely.



The Remainder Theorem

If the polynomial $f(x)$ is divided by $x - c$, then the remainder is $f(c)$.

... allows us to use synthetic division to evaluate a polynomial...

Ex.5

Evaluate $f(x) = x^5 - 2x^3 - x^2 + 2$, at $x = 3$.