Day 4 Factor Polynomials

Objective: Use the Factor Theorem to determine whether linear binomials are factors of polynomials.

Core Concept

The Factor Theorem

A polynomial $f(x)$ has a factor $x - k$ if and only if $f(k) = 0$.

Example 1:

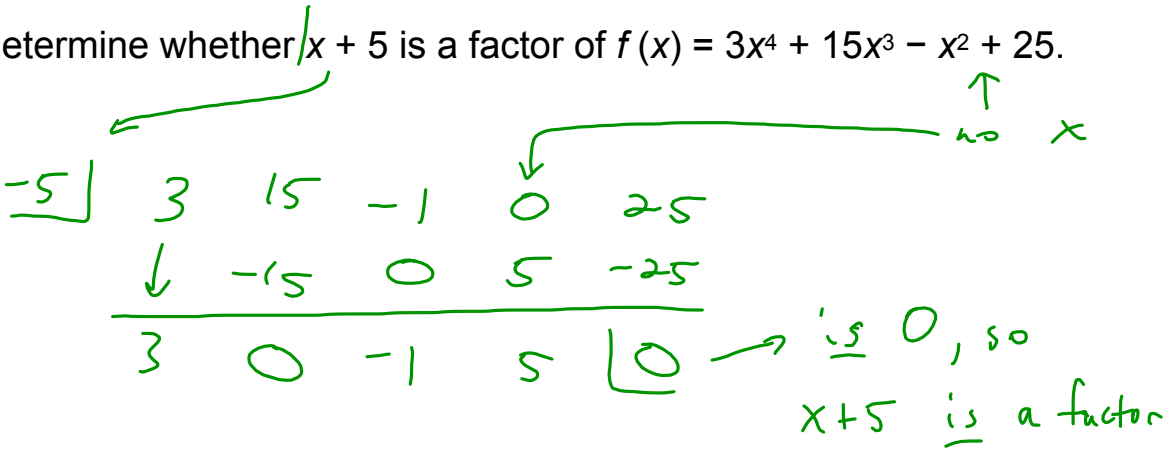
Determine whether $x - 2$ is a factor of $f(x) = x^2 + 2x - 4$.

$$\begin{array}{c|ccc} 2 & 1 & 2 & -4 \\ & \downarrow & 2 & 8 \\ \hline & 1 & 4 & 4 \end{array}$$

→ not 0 so $x-2$ is not a factor.

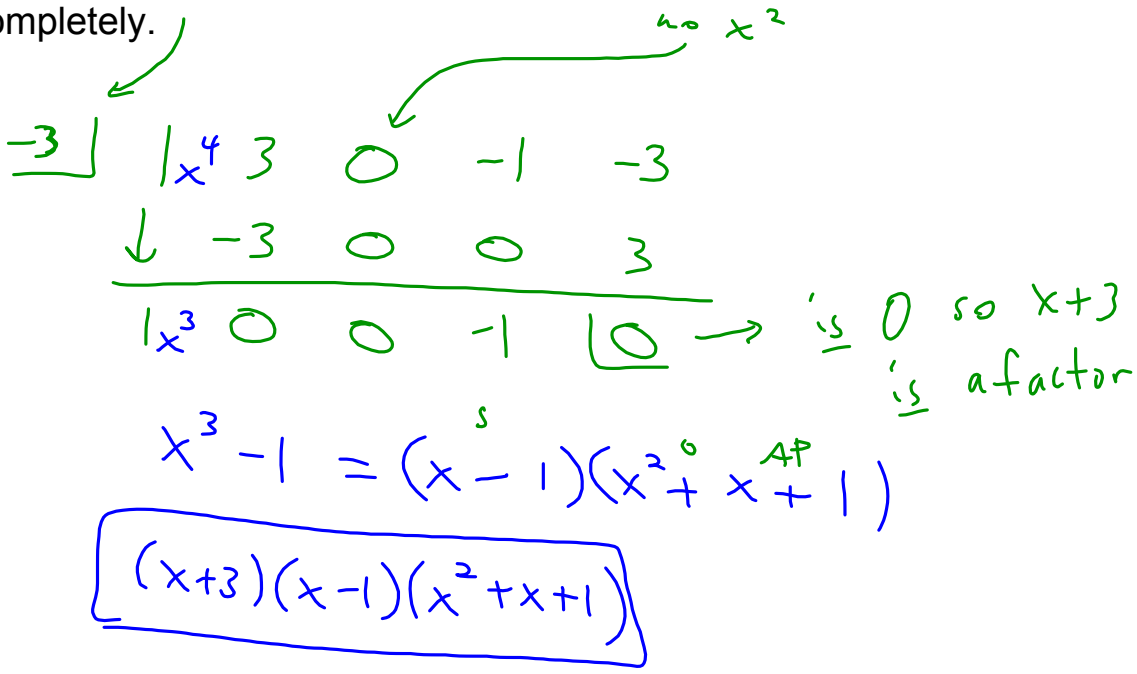
Example 2:

Determine whether $x + 5$ is a factor of $f(x) = 3x^4 + 15x^3 - x^2 + 25$.



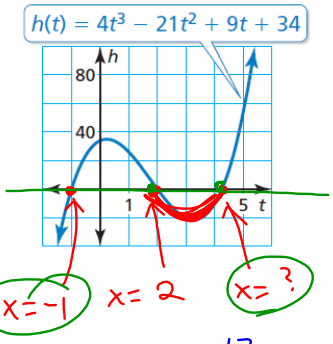
Example 3:

Show that $x + 3$ is a factor of $f(x) = x^4 + 3x^3 - x - 3$. Then factor $f(x)$ completely.



Example 4:

During the first 5 seconds of a roller coaster ride, the function $h(t) = 4t^3 - 21t^2 + 9t + 34$ represents the height h (in feet) of the roller coaster after t seconds. How long is the roller coaster at or below ground level in the first 5 seconds?



$x = 2$

$2 \mid 4x^3 - 21 \quad 9 \quad 34$

$\downarrow \quad 8 \quad -26 \quad -34$

$4 \quad -13 \quad -17 \quad 0$

$4x^2 - 13x - 17 = 0$

$A = 4 \quad B = -13 \quad C = -17$

$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A} = \frac{13 \pm \sqrt{169 + 272}}{8}$

$= \frac{13 \pm \sqrt{441}}{8} = \frac{13 \pm 21}{8}$

$\frac{34}{8} = \frac{17}{4} \qquad \frac{-8}{8} = -1$

$-1 \mid 4 \quad -13 \quad -17$

$\downarrow \quad -4 \quad 17$

$4 \quad -17 \quad 0$

$4x - 17 = 0 \rightarrow x = \frac{17}{4}$

$[2, 4\frac{1}{4}]$ so $2\frac{1}{4}$ sec.