Objectives: *You will learn how to use synthetic division to divide polynomials by other polynomials.*

Synthetic Division: Shortcut for long division.
To divide $ax^3 - bx^2 - cx + d$ by $x - k$:

coefficients of dividends

Vertical pattern: Add Terms
Diagonal pattern: Multiply by k

remainder

coefficients of quotient (answer)

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Example:
Divide $x^4 - 10x^2 - 2x + 4$ by $x + 3$.

Don't forget to include missing terms!!

$$-3 \mid 1 \quad 0 \quad -10 \quad -2 \quad 4$$

$$x^3 - 3x^2 - x + 1 + \frac{1}{x+3}$$

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$$-5 \mid 1 \quad 1 \quad -13 \quad 35$$
$$\quad\quad -5 \quad 20 \quad -35$$
$$1 \quad -4 \quad 7 \mid 0$$

$$\boxed{x^2 - 4x + 7}$$

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