

NOTES: POLYNOMIAL DIVISION

DAY 7

Textbook Chapter 5.5

OBJECTIVE: Today you will learn about how to find zeros using polynomial division!

1. Remainder and Factor Theorem

KEY CONCEPT

For Your Notebook

Factor Theorem

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

Given the number: 20,

If one factor is 5, what is the other factor? _____

Given the function: $y = 3x^2 + 10x + 8$

If one factor is $(x + 2)$, how do you find the other factor?

Long Division

There are 2 ways to divide polynomials: long division and synthetic division.

2.
$$x-2 \overline{) x^3 + 2x^2 - 6x - 9}$$

3. Divide $f(x) = x^4 + 4x^3 + 16x - 35$ by $x + 5$

SYNTHETIC DIVISION: Synthetic division works differently!

1. Divide $x^3 + 2x^2 - 6x - 9 \div (x - 2)$



a. First, the divisor must be in the form: $(x - k)$ What is k in the divisor $(x - 2)$? _____

b. Write down the coefficients of each term. If a term is missing, you must use a zero as a place holder.

c. Then drop, multiply and add, multiply and add, etc.

d. The answer is found by filling in the terms backwards. The last term is the remainder.

$$x^2 + 4x + 2 + \frac{-5}{x - 2}$$

2. Factor $f(x) = x^3 - 2x^2 - 40x - 64$ completely given that $x - 8$ is a factor.

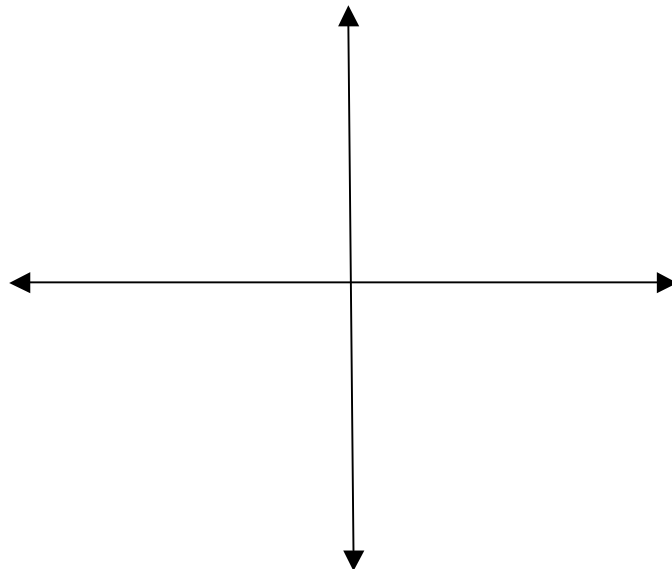
a. **Synthetic Division** - because $x - 8$ is a factor, $f(8) = 0$, and $x = 8$ is a solution.

b. Write as a product of 2 factors.

c. Then completely factor.

$$f(x) = (\quad) (\quad) (\quad)$$

d. Graph: $f(x) = x^3 - 2x^2 - 40x - 64$



PRACTICE: POLYNOMIAL DIVISION

DAY 7

1. Factor $f(x) = 3x^3 - 4x^2 - 28x - 16$ completely given that $x + 2$ is a factor.

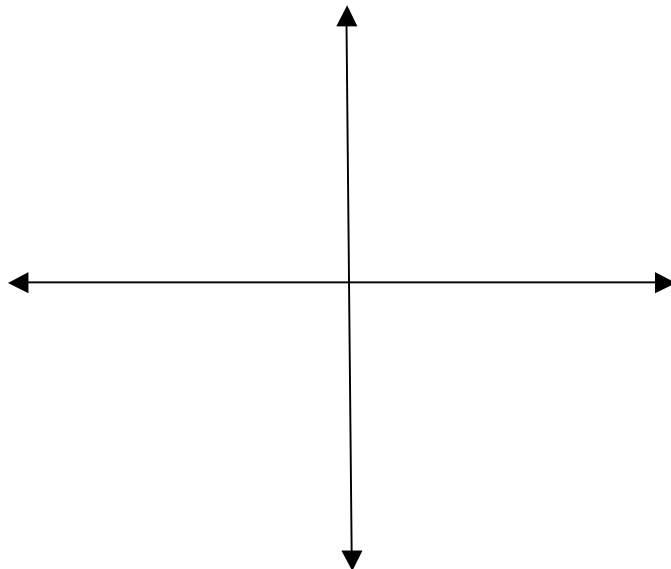
a. **Synthetic Division** - because $x+2$ is a factor, $f(-2) = 0$, and $x = -2$ is a solution.

b. Write as a product of 2 factors.

c. Then completely factor.

$$f(x) = (\quad) (\quad) (\quad)$$

d. Graph!



2. One zero of $f(x) = x^3 + x^2 - 16x - 16$ is 4. Find all the zeros.

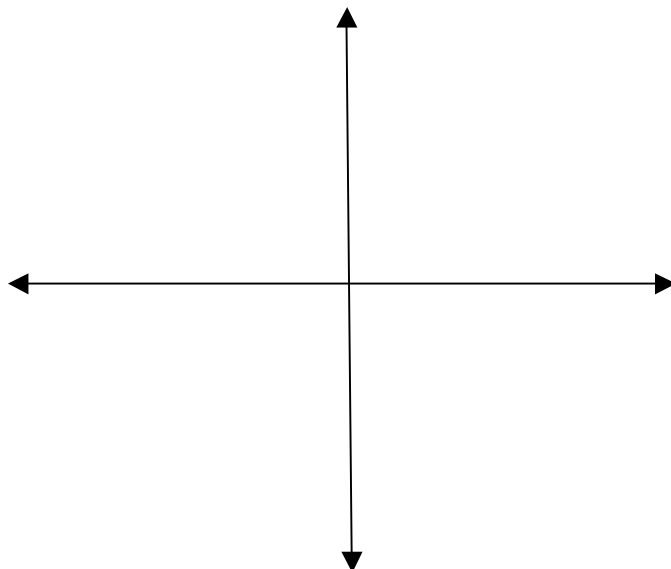
a. **Synthetic Division** - because $f(4) = 0$, $x = 4$ is a zero/solution, and $x - 4$ is a factor.

b. Write as a product of 2 factors.

c. Then completely factor.

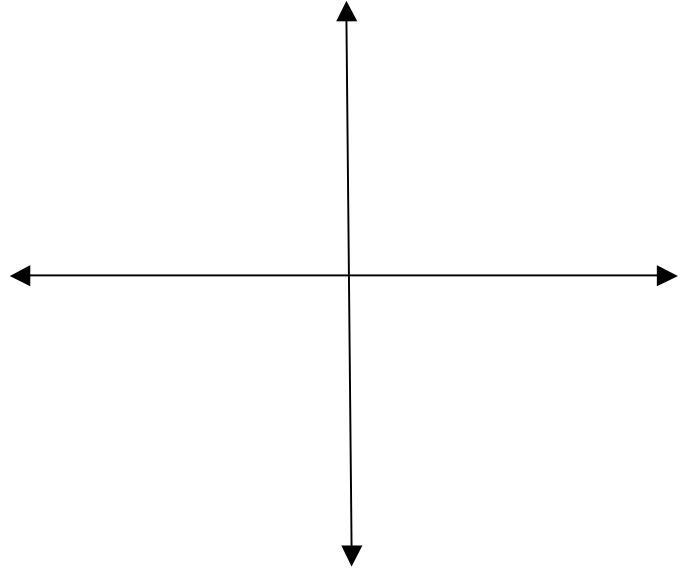
$$f(x) = (\quad) (\quad) (\quad)$$

d. Graph!



3. **GRAPH:** $f(x) = x^4 + 4x^3 + 16x - 35$ by $x + 5$ using synthetic division.

One zero of $f(x) = x^4 + 3x^2 - 4$ is 1. Find all the zeros.



4. Divide $f(x) = x^4 + 4x^3 + 16x - 35$ by $x + 5$ using synthetic division.