LESSON 4.3c

Polynomial Remainder Theorem

Today you will:

- Use synthetic division to evaluate a polynomial function
- Practice using English to describe math processes and equations

Core Vocabulary:

- Polynomial Remainder Theorem, p. 176

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

The Remainder Theorem tells you that synthetic division can be used to evaluate a polynomial function.

The trick?

To evaluate $f(x)$ when $x = a$ … i.e. find $f(a)$ … use synthetic division with $k = a$ … the remainder is $f(a)$

Example:
$\frac{x^2-6}{x-2}$ or $(x^2-6) \div (x-2)$ … $k = 2$

2	1	0	−6
		2	4
	1	2	-2

$f(2) = -2$

$Try\ it$: $f(2) = (2)^2-6 = 4-6 = -2$

Use synthetic division to evaluate $f(x) = 5x^3 - x^2 + 13x + 29$ when $x = -4$.

SOLUTION

-4	5	-1	13	29
		-20	84	-388
	5	-21	97	-359

The remainder is -359. So, you can conclude from the Remainder Theorem that $f(-4) = -359$.

Check

Check this by substituting $x = -4$ in the original function.

$$f(-4) = 5(-4)^3 - (-4)^2 + 13(-4) + 29$$

$$= -320 - 16 - 52 + 29$$

$$= -359 \checkmark$$

Use synthetic division to evaluate $f(x) = 4x^2 - 10x - 21$ when $x = 5$.

SOLUTION

5	4	−10	−21
		20	50
	4	10	29

The remainder is 29. So, you can conclude from the Remainder Theorem that $f(5) = 29$.

Use synthetic division to evaluate $f(x) = 5x^4 + 2x^3 - 20x - 6$ when $x = 2$.

SOLUTION

2	5	2	0	-20	-6
		10	24	48	56
	5	12	24	28	50

- The remainder is 50. So, you can conclude from the Remainder Theorem that $f(2) = 50$.

Homework

Pg 177, #19-32, 38, 40