Math Virtual Learning

Algebra 2A
Polynomial Synthetic Division

April 17, 2020

Lesson:
Polynomial Synthetic Division

Learning Target:
LT D2 I can perform polynomial division (long and synthetic) and apply the remainder theorem.

Objective:

Students will be able to divide polynomials using synthetic division.

Warm Up
Divide and solve the following problems

$(7x^2 + x - 8) \div (x - 1)$

$(x^2 + 11x + 10) \div (x + 1)$

Warm up

$$7x + 8$$
$$x - 1 \,\overline{|\, 7x^2 + x - 8}$$
$$- (7x^2 - 7x)$$
$$8x - 8$$
$$- (8x - 8)$$
$$0 + 0$$

$$\boxed{x \ + \ 10}$$
$$x + 1 \,\overline{|\, x^2 + 11x + 10}$$
$$- x^2 \ - x$$
$$10x + 10$$
$$- 10x - 10$$
$$0$$

Lesson

You will need to watch the following videos:

Intro to Synthetic Division

How To Do Synthetic Division

Lesson

For Synthetic Division

1. You can only use when the divisor is a binomial
2. To find the number in the division box, set the divisor equal to zero and solve.
3. Add down. This is different than long division in which you subtract down.

Practice

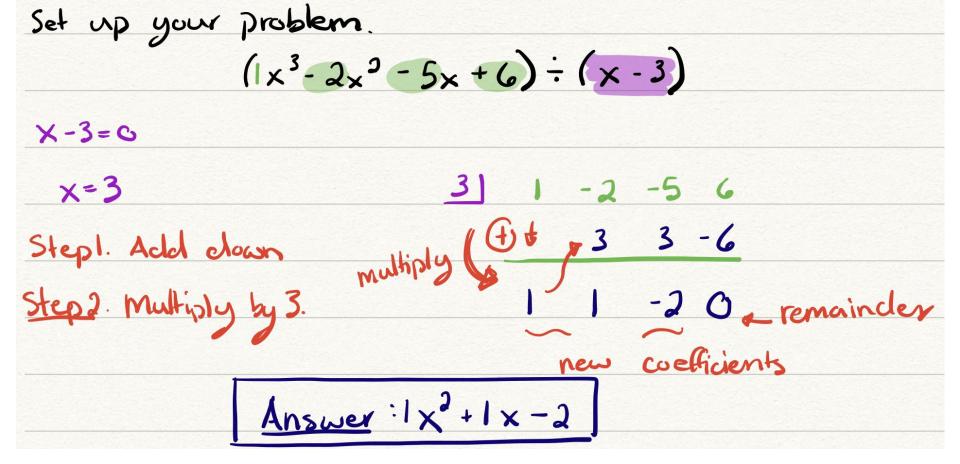(x³ - 2x² - 5x + 6) ÷ (x - 3)

(x³ + 5x² + 7x + 2) ÷ (x + 2)

(7x³ + 6x - 8) ÷ (x - 4)

(3x⁴ - 5x² + 6) ÷ (x - 2)

Here are four problems for you to try. Check your answers on the next slides when you have first tried the problem on your own.

Set up your problem.

$$(1x^3 - 2x^2 - 5x + 6) \div (x - 3)$$

$x - 3 = 0$

$x = 3$

Step 1. Add down

Step 2. Multiply by 3.

$$3 \rfloor \quad 1 \quad -2 \quad -5 \quad 6$$

multiply $\oplus \downarrow \quad 3 \quad 3 \quad -6$

$$1 \quad 1 \quad -2 \quad 0 \quad \leftarrow \text{remainder}$$

new coefficients

$$\boxed{\text{Answer} : 1x^2 + 1x - 2}$$

$$(x^3 + 5x^2 + 7x + 2) \div (x + 2)$$

Work

$x + 2 = 0$

$x = -2$

$$-2 \,|\quad 1 \quad 5 \quad 7 \quad 2$$

$\oplus \downarrow \qquad -2 \quad -6 \quad -2$

multiply

$\qquad\qquad 1 \quad 3 \quad\quad 1 \quad 0$

Answer: $x^2 + 3x + 1$

$$(7x^3 + 6x - 8) \div (x - 4)$$

$\uparrow 0x^2$

Work

$x - 4 = 0$

$x = 4$

$$\begin{array}{c|cccc} 4 & 7 & 0 & 6 & -8 \\ & & 28 & 112 & 472 \\ \hline & 7 & 28 & 118 & \boxed{464} \end{array}$$

$(+) \downarrow$

multiply

$\leftarrow$ remainder

Answer: $x^2 + 28x + 118 + \dfrac{464}{x - 4}$

$$(3x^4 - 5x^2 + 6) \div (x - 2)$$

$0x^3 \uparrow$ $0x \uparrow$

Work

$x - 2 = 0$

$x = 2$

$2 \rfloor \quad 3 \quad 0 \quad -5 \quad 0 \quad 6$

$+\downarrow \quad 6 \quad 12 \quad 14 \quad 28$

multiply

$3 \quad 6 \quad 7 \quad 14 \quad \boxed{34} \leftarrow$ remainder

Answer: $3x^3 + 6x^2 + 7x + 14 + \dfrac{34}{x-2}$

Answers to Practice Problems

$x^2 + x - 2$

$x^2 + 3x + 1$

$7x^2 + 28x + 118 + \dfrac{464}{x-4}$

$3x^3 + 6x^2 + 7x + 14 + \dfrac{34}{x-2}$

Additional Resources

[Synthetic Division Notes](#)

Additional Practice

[Synthetic Division Review](#)