

LESSON PLAN

Course: Grade 12 U Advanced Functions

Lesson : 1 - 5

Unit/Chapter: Polynomial Skills

Topic: Synthetic Division

▣ *homework check:* **FM12** p. 23 exercise 1.7

▣ *note:* **Synthetic Division**

Synthetic division is a method used as a “short cut” to long division. It can only be used to divide single variable divisors with exponents of 1. Synthetic division is most commonly used to determine the remaining quotient of a much larger polynomial when asked to factor or solve.

In order to use synthetic division, the polynomial must be in descending order. We use only the coefficients from each monomial, including the divisor. For example, if we want to divide $3x^3 - 2x^2 + 7x - 1$ by $x - 2$. We would write only the coefficients from the polynomial as 3 -2 7 -1 along our division lines. However, because we are dividing by $x - 2$, we use the **root** of positive 2 as our divisor.

$$(2x^3 - 3x^2 - 10x + 5) \div (x - 3) \text{ is written and divided as:}$$

$$\begin{array}{r|rrrr} 2 & 2 & -3 & -10 & 5 \\ & & 6 & 9 & -3 \\ \hline & 2(\times 3) & 3(\times 3) & -1(\times 3) & 2R \end{array}$$

$$\text{Therefore, } (2x^3 - 3x^2 - 10x + 5) = (x - 3)(2x^2 + 3x - 1) + 2$$

$$(2x^3 - 7x^2 - 10x + 26) \div (2x - 3) \text{ is written as:}$$

$$\begin{array}{r|rrrr} \frac{3}{2} & 2 & -7 & -10 & 26 \\ & & 3 & -6 & -24 \\ \hline & 2\left(\times \frac{3}{2}\right) & -4\left(\times \frac{3}{2}\right) & -16\left(\times \frac{3}{2}\right) & 2R \end{array}$$

The coefficients of our answer are notably 2 times more than needed because our divisor was factored before using synthetic division. Therefore,

$$(2x^3 - 7x^2 - 10x + 26) = (2x - 3)(x^2 - 2x - 8) + 2$$

$$\begin{aligned} & (2x^3 - 7x^2 - 10x + 26) \div (2x - 3) = \\ \text{Or} & \qquad \qquad \qquad = x^2 - 2x - 8 + \frac{2}{(2x - 3)} \end{aligned}$$

▣ *homework assignment:* **FM12** p. 25 exercise 1.8

EXERCISE 1.8

B 1. Divide using synthetic division and state restrictions.

- (a) $(x^3 + 2x^2 - 8x - 2) \div (x - 1)$
- (b) $(x^3 - 13x^2 + 20x + 20) \div (x - 5)$
- (c) $(x^3 + 10x^2 + 29x + 20) \div (x + 4)$
- (d) $(y^2 + y^3 - 20) \div (y + 2)$
- (e) $(t^3 - 8t^2 + 19t - 12) \div (t - 3)$

2. Divide using synthetic division and state restrictions.

- (a) $(2x^3 - 4x - 4x^2 + 2) \div (x + 4)$
- (b) $(2x^3 - 13x + 12) \div (x + 3)$
- (c) $(3t^4 - 7 - 14t^2 + 10t + t^3) \div (t + 3)$
- (d) $(3x^4 - 12x^3 - 20x^2 - 30x + 2) \div (x - 5)$

- (e) $(20 - 14y^3 - y + 4y^4) \div (y - 3)$
- (f) $(x^3 - 2x^2 - 75) \div (x - 5)$
- (g) $(t^3 - 4t^2 + t + 6) \div (t - 2)$

3. Divide using synthetic division and state restrictions.

- (a) $(6x^2 - 11x + 7) \div (3x - 4)$
- (b) $(6t^3 - 5t^2 - 13t + 13) \div (2t + 3)$
- (c) $(15y^3 - 18y - y^2 + 8) \div (3y - 2)$
- (d) $(2y^3 - 9y^2 + 11y - 3) \div (2y - 3)$
- (e) $(12 + 8t^3 - 22t^2 - 5t) \div (4t + 3)$
- (f) $(4y^3 - 12y^2 - 37y - 14) \div (2y + 1)$
- (g) $(5x^2 - 13x + 10 + 6x^3) \div (3x - 5)$