If you use synthetic substitution to evaluate f(x) in the previous example when x = 2 you can see that f(2) equals the _____ when f(x) is divided by x – 2. Also, the other values below the line match the _____ of the quotient. For this reason, synthetic substitution is sometimes called _____. Synthetic division can be used to divide any polynomial by a divisor of the form x – k.

Example 5. (utilizing example 4) $x^3 + 5x^2 - 7x + 2 \div x - 2$

2	1	5	-7	2
		↓ 2	14	14
x	1	7	7	16 ← Remainder

$$x^2 + 7x + 7 + \frac{16}{x-2}$$

Defintion:
Remainder Theorem – If a polynomial f(x) is divided by _____, then the remainder is r = _____ .

Example 6.) Divide $f(x) = 2x^3 + x^2 - 8x + 5$ by $x + 3$ using synthetic division.

-3	2	1	-8	5
		↓ -6	15	-21
	2	-5	7	-16

$$2x^2 - 5x + 7 + \frac{-16}{x+3}$$