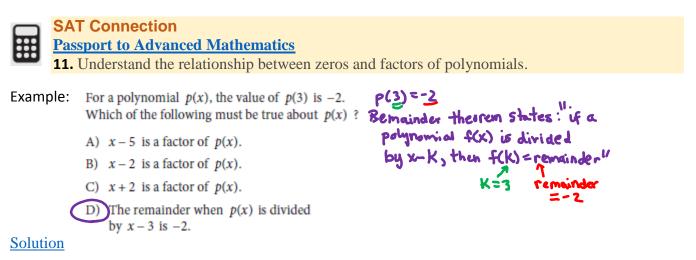
### Unit 2 (Chapter 2): Polynomial, Power, & Rational Functions

# **2.4 Real Zeroes of Polynomial Functions**

Target 2C: Find Real and Complex Zeroes of Polynomials by Synthetic and Long Division



**Rational Zeroes Theorem** 



Watch a video or view a website to learn about Rational Zeroes Theorem <a href="http://www.wtamu.edu/academic/anns/mps/math/mathlab/col\_algebra/col\_alg\_tut38\_zero1.htm">http://www.wtamu.edu/academic/anns/mps/math/mathlab/col\_algebra/col\_alg\_tut38\_zero1.htm</a> <a href="https://www.youtube.com/watch?v=7p2yeuAXSCs">https://www.youtube.com/watch?v=7p2yeuAXSCs</a>

Given a polynomial with integer coefficients,

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0,$$
  
factors of  
L.c. are called  
then  $x = \frac{p}{q}$  is a rational zero of  $f(x)$ .  
where  $\frac{p}{q} = \frac{\text{factors of the constant}}{\text{factors of the leading coefficient}}$ 

(write an example from the website/video) *Example* 1:

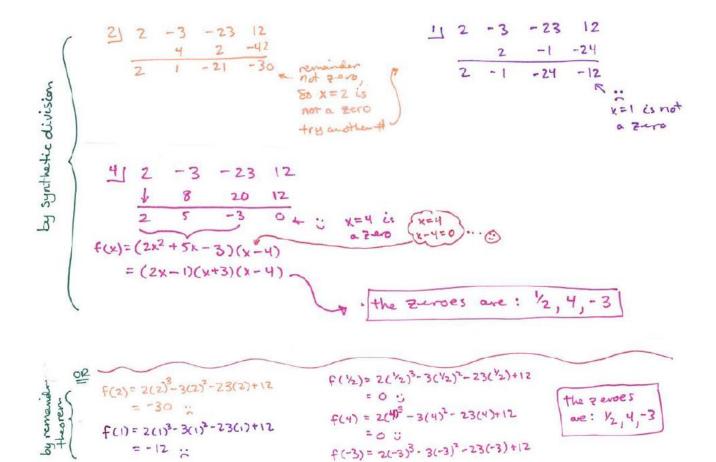
examples vary by student

## Example 2:

Find the rational zeroes of  $f(x) = 2x^3 - 3x^2 - 23x + 12$ 

- Factors of the constant  $\rightarrow p = \{\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12\}$
- Factors of the  $l.c. \rightarrow q = \{\pm 1, \pm 2\}$
- Possible rational zeroes:  $\frac{P}{2} = \{ \pm 1, \pm \pm, \pm 2, \pm 3, \pm \pm, \pm 4, \pm 6, \pm 12 \}$

\* choose a possible rational zero \* do synthetic division or remainder theorem \*



# Example 3:

Find the zeroes of  $f(x) = x^3 - 6x^2 + 7x + 4$  and identify as rational or irrational.

## **More Practice**

**Rational Zeroes Theorem** 

http://www.sparknotes.com/math/algebra2/polynomials/section4.rhtml

http://www.virtualnerd.com/algebra-2/polynomials/roots-zeros/rational-zero-theorem/rational-zerosexample

http://www.math-prof.com/Alg2/Alg2\_Ch\_16.asp

https://www.youtube.com/watch?v=YMyv9-9VXw4

https://www.youtube.com/watch?v=7mNBBBspqUc

Homework Assignment p.217 #33,34,49,51,54,71,72 **Choice D is correct.** If the polynomial p(x) is divided by x - 3, the result can be written as  $\frac{p(x)}{x-3} = q(x) + \frac{r}{x-3}$ , where q(x) is a polynomial and r is the remainder. Since x - 3 is a degree 1 polynomial, the remainder is a real number. Hence, p(x) can be written as p(x) = (x - 3)q(x) + r, where r is a real number. It is given that p(3) = -2 so it must be true that -2 = p(3) = (3 - 3)q(3) + r = (0)q(3) + r = r. Therefore, the remainder when p(x) is divided by x - 3 is -2.

Choice A is incorrect because p(3) = -2 does <u>not</u> imply that p(5) = 0. Choices B and C are incorrect because the remainder -2 or its negative, 2, need not be a root of p(x).