

Math 48B, Quiz 3, Lessons 6 - 10: Zeros of a Polynomial and Rational Functions

In your first draft solutions to this quiz, I encourage you to take extra space and make your work very easy to read. I might encourage you to write one solution per page. I want to focus your mind here on two goals. First, this is designed to help build understanding of the material. Second, as you write your solutions, think about creating a document that you can look back on and understand years into the future. In this way, your solutions can become a so-called second brain where you store math knowledge for future reference. For more about ideas on how to format your solutions, please take a look at Jeff's Conquering College [Study Skills Activity 5](#).

1. POLYNOMIAL DIVISION

1A. Find all zeros of the polynomial $f(x) = 2x^3 - 13x^2 + 3x + 18$. Show your steps and explain how you solve this problem.

1B. Use polynomial long division to solve the following problem:

$$q(x) = \frac{2x^3 - 13x^2 + 3x + 18}{(2x - 3)}$$

1C. Find the complete zero factorization form of the polynomial $f(x) = 2x^3 - 13x^2 + 3x + 18$.

2. ZEROS OF A POLYNOMIAL

2A. Use polynomial long division to solve the following problem:

$$f(x) = \frac{x^3 - 6x^2 + 3x + 10}{(x - 2)}$$

2B. How are the function $f(x)$ from Problem 2A above related to the function $g(x) = x^2 - 4x - 5$? Please graph each function. Also include a discussion of the domain of each function.

3. GRAPHING RATIONAL FUNCTIONS

Consider the rational function below:

$$g(x) = \frac{x + 1}{x - 5}$$

- 3A. Are there any “holes” in this function? If so, where do those holes happen?
- 3B. Where are the vertical asymptotes? Use limit notation to describe the behavior of the function to the left and right of each vertical asymptote.
- 3C. What are the horizontal asymptotes of this function? Use limit notation to describe the end behavior of the function as $x \rightarrow -\infty$ and $x \rightarrow +\infty$
- 3D. What are the x-intercept and y-intercept of this function?
- 3E. Graph this function. You can use Desmos.com. If you do this graph by hand, please label all tick marks and make the graph as accurate as you can.
- 3F. Write this function as a transformation of the function $f(x) = \frac{1}{x}$. How is this work related to the graph you found in Part 3E? Relate this back to your study of transformation of functions from Math 48A.

4. GRAPHING RATIONAL FUNCTIONS

Consider the rational function below:

$$h(x) = \frac{x^2 + 2x - 4}{(x + 2)(x - 3)(x + 4)}$$

- 4A. Are there any “holes” in this function? If so, where do those holes happen?
- 4B. Where are the vertical asymptotes? Use limit notation to describe the behavior of the function to the left and right of each vertical asymptote.
- 4C. What are the horizontal asymptotes of this function? Use limit notation to describe the end behavior of the function as $x \rightarrow -\infty$ and $x \rightarrow +\infty$
- 4D. What are the x-intercept and y-intercept of this function?
- 4E. Graph this function. You can use Desmos.com. If you do this graph by hand, please label all tick marks and make the graph as accurate as you can.