MATH 152, HOMEWORK #8
Due Thursday, October 20

Remember, consult the Homework Guidelines for general instructions. All problems listed by section and exercise number are from our textbook.

GRADED EXERCISES:

1. Section 4.4, Exercise 5.
2. Section 4.4, Exercise 8. Modified directions: describe the function as completely as you can. E.g. what are the domain and range? What features does the graph have – intercepts, asymptotes, etc.? Are there any other obvious points on the graph? When is the function positive, negative, increasing, decreasing? Include a sketch with your work. If there is noticeably different behavior in different cases, them list them as separate cases.
3. Section 5.1, Exercise 2a.
4. Section 5.2, Exercise 5.
5. Suppose that A and B are positive integers, and consider the polynomial form in $\mathbb{R}[X]$ below.

$$f(X) = X^6 - X^5 + (A+B-2)X^4 - (A+B)X^3 + (AB-2A-2B)X^2 - (AB)X - 2AB$$

   (a) What does Descartes' Rule of Signs tell us about the roots of $f(X)$?

   (b) Use the Rational Root Theorem to find two rational roots of $f(X)$.

   (c) Factor $f(X)$ into a product of linear and quadratic polynomials in $\mathbb{R}[X]$. The quadratic factors should not have any real roots.

   (d) Give a complete list of all complex (including real) roots of $f(X)$, and factor $f(X)$ completely into a product of linear factors in $\mathbb{C}[X]$.

MATH JOURNAL – please submit on a separate page (not stapled to the rest of the homework), as this will go directly to Kelli, not the grader. Choose ONE of the following and write 1-3 paragraphs (no more than one page, please).

- Find a high school level problem on logarithms or finding roots of polynomials of degree 3 or higher. This should be a problem that would be difficult for you to explain to someone, but doable. What makes it hard? Can you find multiple ways of explaining the hard parts? (There are plenty of examples online, but you can also come visit my downtown office to browse my various high school books if you want.)
- Reflect on any math education topic you have been thinking about. E.g., a really nice technique for teaching an idea, a situation working with a struggling student and how you handled it or wish you'd handled it, general insights on connecting with students, etc.

UNGRADED HOMEWORK:

Section 4.4, Exercises 3, 6, 7, 10, 11, 12
Section 5.1, Exercises 1, 3, 4, 5, 6
Section 5.2, Exercises 1, 2, 3, 4, 6, 8, 9, 10, 11