Topics

In this document we will review

- Fraction Addition, Subtraction, Multiplication, and Division
- Factoring
- Multiplying by the Conjugate

Why do we need this?

All of these topics have many applications all throughout MTH 132. Examples are listed below from several different sections and chapters.

Example 1 (From Section 1.5/3.5)**.** Find the vertical asymptotes of $f(x) = \dfrac{x^2 - 1}{x^2 - 3x + 2}$

Example 2 (From Section 1.6)**.** Evaluate the limit $\lim\limits_{x \to -2} \left[\dfrac{\frac{1}{x} - \frac{1}{2}}{x + 2} \right]$

Example 3 (From Section 2.2)**.** Use the limit definition to calculate the derivative of $g(x) = \sqrt{9 - x}$

Example 4 (From Section 3.3)**.** Find the intervals on which $h(x) = x - 4\sqrt{x}$ is increasing, decreasing, concave up, and concave down.

Example 5 (From Section 4.3)**.** Evaluate the integral $\displaystyle\int_1^9 \frac{x - 1}{\sqrt{x}}\, dx$

Important Definitions and Theorems

Definition 6 (Fraction Operations)**.**

- Addition: $\dfrac{A}{C} + \dfrac{B}{D} = \dfrac{AD + BC}{CD}$
- Subtraction: $\dfrac{A}{C} - \dfrac{B}{D} = \dfrac{AD - BC}{CD}$
- Multiplication: $\dfrac{A}{C}\left(\dfrac{B}{D}\right) = \dfrac{AB}{CD}$
- Division: $\left(\dfrac{A}{C}\right) \Big/ \left(\dfrac{B}{D}\right) = \dfrac{A}{C}\left(\dfrac{D}{B}\right) = \dfrac{AD}{BC}$

Theorem 7 (Factoring - Difference of Squares)**.**

$$A^2 - B^2 = (A - B)(A + B)$$

Theorem 8 (ac-method for factoring trinomials)**.** Recall: To factor $ax^2 + bx + c$,

1. Compute ac.
2. Look for two factors of ac whose sum is b.
3. Split the middle term into two terms with these numbers as coefficients.
4. Factor by grouping.

Definition 9 (Conjugates)**.** $a + b$ and $a - b$ are considered **conjugates**.

Example: $1 + \sqrt{3}$ and $1 - \sqrt{3}$ are conjugates.

Instructional Videos

Click on the following links to access helpful instructional videos:

- Multiplying by a Conjugate
  `www.math.msu.edu/classes/mth_132/review_video/frac1.aspx`
- Multiply and Simplify Rational Expressions
  `www.math.msu.edu/classes/mth_132/review_video/frac2.aspx`
- Simplifying Rational Expression
  `www.math.msu.edu/classes/mth_132/review_video/frac3.aspx`
- Simplifying Rational Expressions using the ac-method
  `www.math.msu.edu/classes/mth_132/review_video/frac4.aspx`
- Adding/Subtracting and Simplifying Rational Expressions
  `www.math.msu.edu/classes/mth_132/review_video/frac5.aspx`

Now that you have been exposed to all the ideas and seen a couple solutions worked out you should try a few problems. Please see the quiz which has some questions for you to try and the answers posted at the end. The important thing is the work that leads to the answers. That's where you come in!