INTERMEDIATE ALGEBRA

Notes on Chapter Five

These helpful notes do not in any way replace your own work and study (and these aren't the notes that you can turn in for extra credit—see the guidebook for information on how to correctly make those notes). Following are just a few hints that can help you avoid a few of the common mistakes that students tend to make in chapter 5.

SECTION 1:

1. Example 7 on page 225 shows how scientific notation can be used with a formula such as distance = rate • time, or d = rt. In the example, distance and time are given, so you have to find rate, which requires you to solve for r: r = d/t. This leads to scientific notation division.
2. Scientific notation requires that one number, and only one number, be to the left of the decimal point. Therefore, if you multiply or divide and end up with something like 32×10^8, you are not finished. That is not a correct answer. You must move the decimal to the left and correspondingly increase the exponent. So, the correct answer would really be 3.2×10^9. Although this seems picky, that's the way math is: precise, exact, specific. It's simply right or wrong, so make sure you carefully follow rules like this exactly as they are.

SECTION 2:

1. When you have: $-(3x^2 + 5x - 4)$, the negative outside the parentheses changes the sign of every term inside the parentheses. Therefore, $-(3x^2 + 5x - 4) = -3x^2 - 5x + 4$. One way to think of this is to remember that the negative/minus sign really means there's a –1 there. So $-(3x^2 + 5x - 4)$ is really the same as $-1(3x^2 + 5x - 4)$. When you use the distributive property (multiply the negative one to each term inside the parentheses) you get: $3x^2 \cdot {}^{-}1 + 5x \cdot {}^{-}1 - 4 \cdot {}^{-}1$ which becomes $-3x^2 - 5x + 4$. That's the mathematical reasoning behind changing all the signs. **WARNING**: Forgetting to change every sign inside the parentheses is a very common mistake. Now that you know about it, don't forget it!
2. The FOIL method is a good one for multiplying binomials. However, you're better off if you remember the basic concept of taking the first term and multiplying it to every term in the second binomial, then taking the second term and multiplying it to every term in the second binomial. You can use that method to multiply polynomials no matter how many terms they have. So, $(6x - 2)(3x^2 + 7x - 4) = 6x(3x^2 + 7x - 4) - 2(3x^2 + 7x - 4)$
3. **Don't make the common squaring mistake:**
    a. INCORRECT: $(3x + 5)^2 = 9x^2 + 25$ Don't do that! Remember that an exponent means that you multiply the base to itself, that many times.
    b. CORRECT: $(3x + 5)^2 = (3x + 5)(3x + 5) = 9x^2 + 15x + 15x + 25 = 9x^2 + 30x + 25$

SECTION 3:

1. When doing long division, make sure to write parentheses and the minus sign outside the parentheses, before you try to subtract as part of the division procedure. It's very easy to accidentally add when you should subtract, or subtract when you should add, if you've forgotten to change the sign because the minus sign changes the sign of each term that is to be subtracted. This is the most common mistake when dividing polynomials, so be very careful about it. Writing the parentheses and putting the minus sign helps many people avoid this mistake.

2. When doing either long division of polynomials or synthetic division of polynomials, you must account for every variable term. So, if your dividend is $8x^3 + 4x + 25$, it's really $8x^3 + 0x^2 + 4x + 25$. When you divide, you thus use the 0 coefficient variable term as you go through the normal procedures.
3. When doing synthetic division, don't forget that the number you put in the little box on the left must be the OPPOSITE of the number with the x. So, $(x - 2)$ means you'll use +2. If you have $(x + 5)$, you'll use –5.
4. If you have a remainder when doing synthetic division, the original divisor is the denominator,

<u>SECTION 4:</u>

1. Use the available handout that summarizes all the main types of factoring polynomials. To find the handout, go to the Intermediate Algebra Course Info webpage (which is linked from the main page of the Math Department website), and look at the November row in the chart at the bottom of the webpage.
2. Memorize the cube factoring patterns. Factoring the sum of two cubes and the difference of two cubes is exactly the same—except that the minus sign is in a different place.

<u>SECTION 5:</u>

Figuring out when to use the absolute value when simplifying radicals can be very difficult. Here are some basic things to consider, which will help you with this:

1. The purpose of the absolute value bars is to ensure that the variable coming out from under then radical sign is positive, since you can not have a negative inside a radical.
2. Only variables, or terms with variables, need absolute value bars when simplifying radicals.
3. If the exponent of a variable under the radical is the same as the index, and both are even, and that variable when it come out from under the radical, has an odd exponent, only the absolute value of that variable can be a correct answer. Thus, you must use the absolute value bars to indicate that the answer will be positive. See page 247, example 2 for two examples of how this works.

<u>SECTION 6:</u>

The conjugate (shown in example 6 on page 253), is simply the way to rationalize the denominator (see example 2 on page 251) when the denominator is more complicated than a radical. The conjugate concept works just like $(a + b)(a - b) = a^2 - b^2$. As long as one expression has a plus sign, and the other expression has a minus sign, multiplying them will result in canceling the middle terms and leaving only the a and b, both squared—which results in removing the radical sign, and rationalizing the denominator. The simple way to think of this is to make up the conjugate by just changing the sign inside the expression, and then multiply both numerator and denominator by that conjugate.

<u>SECTION 7:</u>

For practical purposes, rational just means fraction. If you have fractions as exponents, use the same exponent rules as with integers. When you add, subtract, or multiply fractions, normal fraction rules apply (such as, you must have the same denominator when you add or subtract fractions, but not when you multiply fractions).

<u>SECTION 8:</u>

The most common mistake people make in this section is something you've seen before. When you have an equation where you're going to have to square both sides, do the algebra first! Look at example 1 on page 263. The 2 must be subtracted from both sides FIRST. In example 3 (page 264), you have to add 2 and then divide by 3 before cubing both sides. Forgetting to do the algebra first is where many people went wrong when they did absolute value equations back in sections 1-4 and 1-6.