Wilfrid W. Csaplar Jr. College Algebra Review Sheet for Exam 1

This review sheet is intended to cover everything that could be on the exam. However, it is possible that I may have inadvertently overlooked something. You are still responsible for everything in the chapters covered except anything that I explicitly say you are not responsible for. Therefore, if I left something off of this sheet, it can still be on the exam. There will be no multiple-choice questions. Most of the questions will be like the ones on the homework assignments and quizzes. There will **not** be a choice of which question you do. <u>If you do not show work, you will not get credit.</u>

The optional review session for this test will be Thursday, 9/18 at 8:45 in a room yet to be announced.

Section 1-1: This section is just memorization. Memorize the following terms: set, element, null set, rule, listing, real number (R) , rational numbers (Q), integers (Z), natural numbers (N), and variable. Know the following properties of addition and multiplication: closure, associative, commutative, identity, inverse, and distributive. Note that most of those properties do not apply to subtraction or division, so convert them to addition (by adding the additive inverse) or multiplication (by multiplying by the multiplicative inverse) before using the properties.

Section 1-2: When multiplying two variables like X^m and X^n, add exponents. A polynomial is a series of terms added or subtracted, where all exponents are members of Z. The degree of the polynomial is the highest exponent (the "m" in X^m). When distributing, make sure you distribute it by multiplying all terms. (A term is a coefficient multiplied by variables raised to an exponent or just a number.) When you simplify, combine like terms, (terms with the same exponents). When multiplying two polynomials, multiply **all** terms in the first polynomial by **all** terms in the second polynomial. For two binomials (a polynomial with two terms) multiplied by each other, FOIL it, (First, Outer, Inner, Last). **If the firm polynomial has m terms and the second polynomial has n terms, then before simplifying, the product of them will have m*n terms.** Make sure you find them all. <u>Memorize the three special products on page 18. They will be very helpful.</u>

Section 1-3: A prime number is only divisible by itself and 1, thus, it cannot be factored. Similarly, a prime polynomial cannot be factored. **To prove a polynomial is prime, you must try all possible ways of factoring it.** The special products from page 18 can be reversed easily, memorize them. If the polynomial is of the form $X^2 + bX + c$, then it must factor as (X+d)(X+e). Here, d*e must equal c and d+e must equal b. If b and c are positive then so are d and e. If b is negative but c is positive, then both d and e must be negative. If c is negative, then d and e have opposite signs. If the polynomial is of the form $aX^2 + bX + c$, then it factors as (fX + d)(gX + e). Here, f*g = a, d*e = c, and FOIL to determine if you get the b for the middle. Note the signs mentioned above for d and e also apply here. When factoring a, you do not need to try the negatives or the reversed orders. **When factoring c, you must use the factors in both orders and if c is negative, use the negative on each term.** For example, if c = -12, you must try

(1, -12), (-1, 12), (2, -6), (-2, 6), (3, -4), (-3, 4), (4, -3), (-4, 3), (6, -2), (-6, 2), (12, -1), (-12, 1). However, if a = 12, you only have to try (12, 1), (6, 2), and (4,3). (If a = 1, then you do not need to reverse the order of the factors of c.)

Section 1-4: Rational expressions are fractions with polynomials in the numerator and the denominator. Only cancel terms when you have just multiplication and division without addition and subtraction. For example, you cannot cancel anything in the expression: $\frac{X^2 + 4X + 3}{X^2 + 2X + 1}$ because you have addition. You must first factor it as $\frac{(X + 3)(X + 1)}{(X + 1)(X + 1)}$ and then you can cancel the X+1. When you divide by a fraction, multiply by its inverse. If you cannot factor one or more of the polynomials, note that things may cancel later, so try using factors you have already found in other expressions. For example, if you got an answer to $\frac{(X + 1)(X + 2)}{X^2 + 25X + 24}$, but cannot factor the denominator, then test to see if it can factor as either (X+?)(X+1) or (X+?)(X+2). One of them is likely to work, because then the expression will simplify. Before adding or subtracting, make sure you have a common denominator. If necessary, multiply both top and bottom of a fraction by the same term to get the denominators the same. If you have an expression like $\frac{\frac{1}{X} + 2}{\frac{3}{X^2} - 3}$, multiply both the numerator and the denominator by X^2 and you will get rid of the fractions inside the fractions. **Make sure you multiply all terms.** This will yield $(X + 2X^2)/(3 - 3X^2)$.

Section 1-5: Note that $X^{-m} = 1/X^m$. Simplify until you have only positive exponents. The negative exponents work just the positive ones as far a multiplying and dividing. The only difference is that a negative exponent flips the fraction upside-down. Scientific notation of $X*10^m$ is just X with m zeros after it. If m is negative, then it is X with m-1 zeros in front of it.

Section 1-6: A fractional exponent means it is a root, a.k.a. radical. (As you will learn in section 1-7, $X^{1/n} = \sqrt[n]{X}$.) That means if $Y = X^{1/n}$, then $Y^n = X$. Note that $X^{1/2}*X^{1/2} = X^{1/2+1/2} = X$. This is exactly how the exponents worked before, but you are now dealing with fractions. **Warning: you cannot raise a negative number to a fractional exponent with an even denominator.** For example, you cannot calculate $(-4)^{1/2}$ because nothing squared is negative.