Wilfrid W. Csaplar Jr. College Algebra Review Sheet for Exam 2

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 questions to choose from. If you do not show work, you will not get credit.

The optional review session for this test will be Thursday, 10/9 at 8:45 in the "normal room," Richardson 021. My home phone number has changed to 829-4383.

Section 1.7: Radicals are the same as the fractional exponents from section 1.6. It is often handy to convert them into fractional exponents before working with them. Note that if there is only multiplication inside the radical, you can switch the order of the exponent and radical like $\sqrt[5]{X^3} = (\sqrt[5]{X})^3$ because both are $X^{3/5}$. **Never leave a larger exponent inside the radical than the index** (the 5 in the example above). So $\sqrt{X^5}$ can be split into $\sqrt{X^4} * \sqrt{X} = X^2\sqrt{X}$. **Make sure there are no radicals in the denominator of a fraction.** To get rid of it, multiply the top and bottom of the fraction by the same thing that will cause the denominator to not have a radical. For example, $\frac{3}{\sqrt{2X}}$, can be simplified by multiplying the top and bottom by $\sqrt{2X}$. This would give $\frac{3\sqrt{2X}}{2X}$. **Do not leave a fraction in a radical**. Split it into two radicals and get rid of the radical in the denominator. For example: $\sqrt{\frac{3}{X}} = \frac{\sqrt{3}}{\sqrt{X}} * \frac{\sqrt{X}}{\sqrt{X}} = \frac{\sqrt{3X}}{X}$. You will not be held responsible for n-th degree radicals in the denominator or the addition of radicals in the denominator. Examples of these are $\frac{1}{\sqrt[3]{X}}$ and $\frac{1}{\sqrt{X} + \sqrt{3}}$.

Section 2.1: When solving equations for a variable like *X*, you must **do the same thing to both sides of the equal sign.** To move something to the opposite side of the equal sign, do the opposite operation of the current operation. For example, suppose you had $\frac{4X}{5} + 3 - X = 9$. If you wanted to move the 3 over, subtract (opposite of addition) 3. If you wanted to move the *X* over, add (opposite of subtract) *X* from both sides. If you wanted to move the 5, multiply (opposite of divide) both sides by 5. **Remember that you have to multiply every term on both sides.** So you would multiply 5 by the (4/5)*X*, the 3, the *X*, and the 9. Similarly, if you wanted to move the 4 over, you would divide (opposite of multiply) **all** terms by 4. Because multiplication and division are done to all terms, it is generally better to do the additions and subtractions before the multiplications and divisions, unless there is a common factor in all terms. If two things are equal, you can substitute one for the other. (This is more helpful in the next section.)

For solving word problems. Follow the instructions below:
1) Read the problem – several times if necessary – until you understand what is being given and what is being asked for.

2) Let one of the unknown quantities be represented by a variable, typically the first letter of the unknown quantity. (Airspeed = A, etc.) You can use multiple variables. It may be helpful to think ahead to step 2B before deciding which unknown quantities to represent with variables.

  2A) Draw a figure when appropriate.

  2B) Look for formulas that connect the unknowns.

3) Form equations that relate unknown quantities to known quantities. Make sure you have the same number of equations as unknown variables.

4) Solve the equations for all unknown quantities. Make sure you write the units for the variables.

5) Make sure you check your answers with the word problem initially given and in the equations in steps 2B and equation 3.

For distance and/or rate problems, it is helpful to remember Rate = Quantity/ Time, i.e. R = D/T. (I used D for quantity because the quantity is normally a distance.) Similarly, D = R*T, and T = R/D. If you only remember one, you can derive the other two by division or multiplication.

For mixture and/or percentage problems, it is helpful to remember $\frac{\%_1 * Q_1 + \%_2 Q_2}{Q_1 + Q_2} = \%_{desired}$. The "1" subscript is for the first item mixed and the "2" is for the second item mixed.

Section 2.2: To solve a system of equations with multiple variables, we solve one equation for one variable and substitute it into the other equation. Continue until you have only one equation in one unknown. Then solve that equation as you did in section 2.1. **Do not substitute an equation back into itself.** For example, if you solved $X + Y = 8$ for X, do not substitute it back into that same equation. If you do, the equation will simplify to 8 = 8. That is always true, but not helpful. The steps of solving word problems with two or more variables is the same as with one variable, except that there is more work in steps 2B and 3.

Section 2.3: Inequalities are easy to work with, but require a tiny bit more work than equalities. When graphing, if there is a $<$ or $>$ sign, then you use the (or), and if there is a $\leq$ or $\geq$, then use [or]. Therefore, (2,4] is $2<X\leq 4$. When plotting unions, ∪, plot everything that is in either one or in both. (Just like with the union of marriage, everything now includes all that both had before.) When plotting intersections, ∩, you only plot what is in both. (Just like a street intersection, it has to be in both sets.) When solving inequalities for a variable, you must do the same procedures as for equality. However, there is one major difference. If you either multiply or divide by a negative number, reverse the inequality. If you start with $-3<-X<5$, and you multiply by -1, you would get $3>X>-5$. (Note that if you forgot to reverse the sign, you would get $3<-5$.) As I have just illustrated in this example, if you have a double inequality, you must do the same procedure to **all** three sides of the inequality. (However, you can break it into two inequalities, solve them, and reassemble them. That method will always work, but usually requires two or more extra steps.).

Section 2.4: You are only responsible for being able to take the absolute value of an expression, and graphing simple inequalities with absolute values. For example you will have to know how to plot $|X-4| <6$ or $|X+2|\geq 5$, but not $|X-3| < 3X$. Absolute values convert negative numbers to positive only and leave positive numbers alone. **Note that $|4-2| \neq |4|+|-2|$ and $|-4+2| \neq |-4|+|2|$. You cannot distribute the absolute values through.** When plotting $|X-4|<5$, you start at 4 and go five units in both directions. You find all points between them because of the <. If you are plotting $|X+4|$, then start at -4 and go five units in both directions. Fill in all points **except** those between the two points.