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. <u>You will not get credit for answers given without work.</u>

The optional review session for this test will be Thursday, 10/9 at 8:45. I plan to have it in the "normal room," Richardson 021, but I will announce the location later.

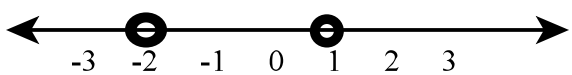
Section 2.4: When you have |X+2|<4, you get rid of the absolute value by writing -4<X+2<4. Which is the same as -4< X+2 and X+2<4. This is because the distance between X and -2 is small, so you cannot go far in either direction. If you have |X-1|>5, then you get rid of the absolute value by writing X-1>5 or X-1<-5. This is because the distance between X and 1 is large. Therefore, X must be very large or very small. Once you get rid of the absolute value, treat the equations just like equalities. Except, you must remember to reverse the inequality if you multiply or divide by a negative number. If you write an equation such as -4<X+2<4, then you must perform the same operation to **all three** parts. In this case, I would subtract 2 and get -6<X<2.

Section 2.5: The square-root of -1 is defined as "i." You treat i as if it is any other letter, i.e., variable. However, there are two differences. First, you do not want to leave any term with i to a power other than 1. Since $i^2 = -1$, $i^3 = -i$, and $i^4 = 1$, you can always simplify expressions with i to an exponent greater than 1. To simplify a fraction with i in the denominator, multiply both the top and bottom of the fraction by the conjugate. The conjugate is the same as the complex number except the sign of the coefficient on i is reversed. Therefore the conjugate of 4 + 3i is 4 - 3i, and the conjugate of 3 - 2i is 3 + 2i. To simplify 3/(1+2i), we multiply by (1-2i)/(1-2i) and get: $\frac{3(1-2i)}{(1+2i)(1-2i)}$. Because the O and I terms of FOIL cancel, this simplifies to $\frac{3(1-2i)}{1-4i^2}$. Remembering that $i^2 = -1$, the denominator becomes 1+4 = 5. Thus, the final answer is $\frac{3-6i}{5}$, or 3/5 - (6/5)i, or 3/5 - 6i/5.

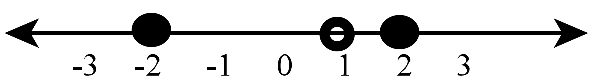
Section 2.6: Quadratic equations are of the form $aX^2 + bX + c = 0$. This is called the **standard form**. There are four methods to solving them. On a test, I will not specify which you use. The first one is helpful some of the time. It is the **factoring method**. In some cases, brief inspection will enable you to factor the equation. If you can, then factor the equation. Assuming it factors as $(dX + e)(fX + g) = 0$, we know that $dX + e = 0$ or $fX + g = 0$. Solve the two equations and then state that X can be either of the solutions. A second method, that is only generally useful in rare circumstances, is the **square root method**. Basically, use it if and only if b = 0. For example, if you can get the equation to be of the form $aX^2 + c = 0$, then change it to $X^2 = -c/a$. Take the square-root of both sides, remembering to do $\pm$ to the right side. In other words, if you have $X^2 = 9$, then the square root method yields $X = \pm 3$. The only other time this method is useful is when you have $(X + h)^2 = k$. The third method is one that I recommend you do not use. It is the **completing the squares method**. In this case, you convert the equation from the standard form to something useable in the square root method. This method is cumbersome and hard to do. If the first two methods will not work, then I would use the fourth method, the **quadratic equation**. Making sure that the equation is in the standard form, we know that $X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Remember that the first part is -b not b. Do **not** separate the square root into two square roots. Also, remember to divide everything by 2a. This method will always work, but because the calculations can be messy, bring a calculator. For **word problems**, do your work just like the word problems from the earlier parts of chapter 2. (See review sheet for exam #2.) This time, your equations will be quadratic equations.

2.7: **If you have an equation with a radical**, you can square both sides of the equation. However, there are three potential problems. **First, make sure that the radical is by itself on one side of the equation.** If there is anything else on that side, then the O and I of FOIL will result in a radical. Thus, make sure it is of the form a like $\sqrt{X+1} = X + 2$. **Secondly, make sure you FOIL the other side of the equation.** So in this example, the right-hand side becomes $X^2 + 2X + 2X + 4$. **Thirdly, you will usually create an extraneous solution.** Check all solutions by inserting them into the original equation. Some equations can be converted to quadratic equations. **If you can set another variable, say Y, equal to X to a power, then you may get a quadratic equation in Y.** For example, $4X^{2/3} + 3X^{1/3} - 1 = 0$. Let $Y = X^{1/3}$. This changes the equation to $4Y^2 + 3Y - 1 = 0$. Solve for Y and then **remember to convert back to X**. Y = 1/4 or Y = -1. Since $Y = X^{1/3}$, $Y^3 = X$. (I cubed both sides of the equation.) Thus, $X = (1/4)^3 = 1/64$ or $X = (-1)^3 = -1$.

2.8: Solving inequalities which involve quadratic equations is identical to equalities for much of the process. Change the inequality to an equality. Then convert to standard form and find all solutions. I would then draw a number line and plot all of those points. Choose points that are in each of the sections of the line. Use those points to determine if they are solutions. For example, suppose that $X^2 + X - 2 < 0$. This becomes $X^2 + X - 2 = 0$ That factors as (X+2)(X-1) = 0. X = -2 or 1. Draw the line:



Test out a point to the left of -2, one between -2 and 1, and to the right of 1. I would choose -3, 0, and 2 because those are the easiest numbers to square in those ranges. For X = -3, we get 9 -3 -2 = 4<0, false. For X = 0, we get 0 +0 -2 = -2 < 0, true. For X = 2, we get 4 + 2 - 2 = 4 < 0, false. Therefore, choose (-2, 1). If you have a rational inequality involving quadratic equations, get it into the form of a polynomial divided by a polynomial > 0 (possibly <, $\geq$, or $\leq$). Then find the key points for the polynomial on top and the one on the bottom. After drawing a line like above, find which sections are in the correct area. For example, $\frac{X^2 - 4}{X - 1} \geq 0$, will have key points when $X^2 - 4 = 0$ and when X - 1 = 0. These points are -2, 1, and 2. Because the equation has $\geq$, we can have values for X of -2 and 2, but because the 1 comes from the denominator, we cannot have X = 1. The line looks like:



Testing, -3, 0, 1.5, and 3 will show that if X = -3, we have 5/(-4) $\geq$ 0, false. If X = 0, we have -4/(-1) $\geq$ 0, true. If X = 1.5, then we have -1.75/0.5 $\geq$ 0, false and if X = 3, then we have 5/2 $\geq$ 0, true. Thus, our solution is [-2, 1) or [2, ∞).