Name:_____________________________________ Band:_________

Algebra II | Packer Collegiate Institute | 2008-2009

Final Exam Review Project

We've learned a lot this year. To prepare you for the final exam, each of you will be responsible for creating a study guide and study questions for a few topics we've studied this year. Instructions for the study guide are below. I will collect and scan each study guide, and pass this collective study guide on to you.

If you do a good job, you will be giving your colleagues the gift of a great study guide. If you do a bad job, you will be… well… not really be doing your colleagues any favors.

Since the work we've done on the eight-standard functions and their transformations, exponential equations, and logarithms has been so recent, I am not including them for this study guide project. You will have to review those on your own.

You can make your study guide your own. However, each study guide should include the following:

1. An explanation of the topics being covered. You want to use words and graphs and x-y tables, etc., to explain to your audience what your topic is. <u>You should assume your audience has slightly less understanding of Algebra II than you do.</u>
2. A listing of the relevant pages in the textbook (if applicable) for your topic. If there are particular problems in the textbook which would provide good practice, you should have a list of those problems.
3. A listing of all the SmartBoards (if they exist) for your topic – so students know where to go on the course conference for more information.
4. Example problems: at *least* (but likely more) two example problems, whose solutions you have worked out in detail – explaining every step.
5. Practice problems: At *least* (but likely more) two practice problems, for your colleagues to work on. You will have to have solutions written out on a separate page, for students to check their answers.

Besides these study guides, the **absolute best resources you can use to study are (in order)**:

- Your old assessments
- The Quarter 2 Test Study Guide
- Worksheets we've done in class
- SmartBoards / class notes
- The textbook

Hands down, the absolute best resources you can use to study are your old assessments. If you can do those, you will be fine on the final exam.

RUBRIC

Points	Expectation
_____/ 5	You use proper mathematical terminology and language in your written explanation of your topic.
_____/ 10	You have provided a comprehensive overview on your topic, focusing on illuminating the *concepts* to your classmates. Comprehensive means you have covered all aspects of your topic.
_____/ 3	You have used graphs, tables, charts, number lines, and/or pictures to illustrate your topic (if applicable). You have created your graphs either using your virtual TI, http://graphsketch.com/, or some other graphing program. You have VERY NEATLY written out (or typed) the equations.
_____/ 5	You have chosen *appropriate* example and practice problems. Appropriate means that the problems are similar to ones we have seen on assessments or in class – not too easy and not too hard.
_____/ 10	Your solutions to the example and practice problems are comprehensive. Comprehensive means that the solutions are well-explained so that everyone can follow them.
_____/ 10	Your solutions have *no* mistakes in them. This is of critical importance, because your colleagues will be using these problems as their study guide. Each mistake will result in a significant point reduction.
BONUS _____	You can earn up to 5 bonus points for the following: • Including additional practice problems and solutions for your topic • Finding and including the URLs for videos explaining your topic (YouTube!) • Doing a "going beyond the call of duty" job with your study guide • Coming up with really creative/good additional problems (e.g. multiple choice, true false, explain this statement) • Typing up your work in MS Word, using equation editor to write your equations (You cannot earn over 100% for this project.)

Unit I: Number Lines, Intervals, and Sets

____________ Set notation (union, intersection, subset)
____________ Linear inequalities – graph on a number line
____________ Compound inequalities
____________ Using set and interval notation to write solutions to linear and compound inequalities
____________ Absolute value inequalities

Unit II: Algebraic Manipulation: Rational Expressions and Exponents

____________ Factoring quadratic and cubic expressions
____________ Polynomial multiplication and division (including synthetic division)
____________ Rational expression addition, subtraction, multiplication, and division
____________ Solving rational equations (watching out for dividing by zero!)
____________ Review of basic exponent rules and simplification

Unit III: Radical Equations

SAMPLE_____ Review properties of radicals (integer exponents)
SAMPLE_____ Simplifying radicals and rationalizing the denominator
SAMPLE_____ Solving radical equations

Unit IV: Functions and Relations

___________ Circles
___________ What is a function? (Including the definition of a function and function notation; the vertical line test; independent and dependent variables)
___________ Composition of functions
___________ Finding the domain and range of a function visually (given a graph, what is the domain and range); expressing the domain and range in interval notation.
___________ Finding the domain of a function algebraically (no dividing by zero, no negatives under the square root sign); expressing the domain and range in interval notation
___________ Evaluating a piecewise function from (a) its equation or (b) its graphs
___________ Increasing/decreasing intervals for functions; relative maxima/minima (visually and on calculator)
____________ Max/min word problems (e.g. maximizing area and minimizing cost)

Unit V: Linear Functions

___________ Equations of vertical and horizontal lines
___________ Graphing lines (and their intersections)
___________ Finding parallel and perpendicular lines
___________ Systems of Equations (graphing, substitution, eliminiation)
___________ Linear regressions

Unit VI: Quadratics & Inequalities

___________ Complex numbers (addition, subtraction, multiplication, division)
___________ Powers of *i*
___________ Completing the square (vertex form); finding the vertex
___________ Quadratic formula and discriminant; finding the zeros (real, complex)
___________ Graphing quadratics (1, 3, 5, …)
___________ Linear & Quadratic Inequalities (number line)
___________ Linear & Quadratic Inequalities (coordinate plane)
___________ Quadratic-linear systems

Sample Study Guide for: **RADICALS AND RADICAL EQUATIONS**
NOTE: I am <u>not</u> including practice problems for this study guide.

Relevant Resources:

Textbook Sections: R.6 (pages 38-47) and 2.5 (pages 237-239)
Textbook Problems: R.6 #11-18, 25-28, 45-48, 51-58, 65-74, 89-92
2.5 #25-36, 40-60
Video on Simplifying Radicals: http://www.youtube.com/watch?v=odnQGV0VAKg
Video on Solving Radical Equations: http://www.youtube.com/watch?v=LY8VBsLf-4M
Smartboard: 2008-10-14, 2008-10-16, 2008-10-17, 2008-10-23, 2008-10-24

In previous years, we've learned about square roots. We know $\sqrt{5}$ represents the number that when multiplied by itself gives us 5. When we enter $\sqrt{5}$ on our calculators, we get approximately 2.24 (and when we multiply 2.24 by 2.24, we get approximately 5).

For my study guide, I'm going to explain to you how we can have more than square roots. We can have cube roots, fourth roots, and even *n*th roots. We will also learn how to solve simple equations involving radicals.

First off, I'm going to remind you of some notation:

$$a^{1/2} = \sqrt{a}$$

Any number raised to the $1/2$ power is simply the square root of that number! It may not make sense why this is true immediately, but remembering the exponent rule $a^b a^c = a^{b+c}$ will help us.

Explanation of notation: We know that $\sqrt{5}$ represents the number, that when multiplied by itself, gives us 5. In other words: $\sqrt{5}\sqrt{5} = 5$. However, let me write just one more thing using that exponent rule: $5^{1/2}5^{1/2} = 5^1$. From this it is clear that $\sqrt{5} = 5^{1/2}$.

The same argument follows when I say $\sqrt[3]{5}$ represents the number when multiplied by itself three times gives us 5 (in other words: $\sqrt[3]{5}\sqrt[3]{5}\sqrt[3]{5} = 5$). Similarly, we can say:

$$a^{1/n} = \sqrt[n]{a}$$

DANGER!: There is one important point you must know about radicals. You can never have a negative number under an even root, but you *can* have a negative number under an odd root.

Why?

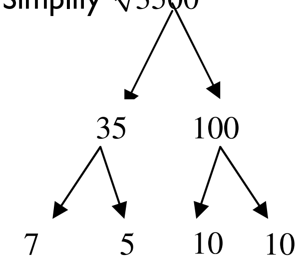
Because if you had $\sqrt{-4}$, you'd need a (real) number that when multiplied by itself, give you -4. But no (real) number when multiplied by itself can give you a negative number! So that doesn't make sense.

However if you had $\sqrt[3]{-8}$, you'd need a number that when multiplied by itself three times, gives you -8. Clearly that number is -2.

Simplifying Radicals

To simplify radicals, you should use a factor tree. If you have an *n*th root, you need *n* factors of a number to "leave" the radical.

SAMPLE PROBLEM 1: Simplify $\sqrt{3500}$



Since there are *two* 10s, this simplifies to $10\sqrt{35}$.

SAMPLE PROBLEM 2: Simplify $\sqrt[3]{1200}$

Without doing the factor tree, I found the factors of 1200 to be 2*2*2*2*3*5*5
Since there are *three* 2s, I can simplify this to $2\sqrt[3]{150}$

Radical Rules

The rules for radicals are the same as the rules you know for square roots:

1. $\sqrt[n]{a}\sqrt[n]{b} = \sqrt[n]{ab}$ (multiplication)
2. $\dfrac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\dfrac{a}{b}}$ where $b \neq 0$ (division)
3. $\sqrt[n]{a^m} = a^{m/n}$

Rationalizing the Denominator

Sometimes when there are square roots in the denominator, we want to remove them. This is relatively simple if we have something like: $\dfrac{3}{\sqrt{2}}$. All we have to do is multiply the expression by $\dfrac{\sqrt{2}}{\sqrt{2}}$ (just 1!):

SAMPLE PROBLEM 3: $\dfrac{3}{\sqrt{2}} = \dfrac{3}{\sqrt{2}} \bullet \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{3\sqrt{2}}{2}$

However, if there you are faced with something like: $\dfrac{3}{\sqrt{2}+1}$, you cannot use the same method! We learned that you can multiply the expression by the *conjugate* of the denominator: $\sqrt{2}-1$

SAMPLE PROBLEM 4: $\dfrac{3}{\sqrt{2}+1} = \dfrac{3}{\sqrt{2}+1} \bullet \dfrac{\sqrt{2}-1}{\sqrt{2}-1} = \dfrac{3(\sqrt{2}-1)}{2-\sqrt{2}+\sqrt{2}-1} = \dfrac{3\sqrt{2}-3}{2-1} = 3\sqrt{2}-3$

Solving Radical Equations

A radical equation is simply an equation with a radical in it. We mainly solved equations with square roots in them.

The simplest form of a radical equation is something like:

SAMPLE PROBLEM 5: $\sqrt{x} = 7$
We see just by looking at it that the solution is $x = 49$. We also know that we could square both sides to get that answer: $\left(\sqrt{x}\right)^2 = (7)^2$, so $x = 49$.

We might have other roots, though, like:

SAMPLE PROBLEM 6:
$$\sqrt[3]{x-1} = -2$$
$$\left(\sqrt[3]{x-1}\right)^3 = (-2)^3$$
$$x-1 = -8$$
$$x = -7$$

The final and most arduous of these types of equations look like $\sqrt{2x+5} + 5 = x$. To solve these, there are certain steps:

STEP 1: Get the radical alone on one side of the equal sign: $\sqrt{2x+5} = x-5$

STEP 2: Square both sides and simplify: $2x+5 = (x-5)^2$
$$2x+5 = x^2 - 10x + 25$$

STEP 3: Get all terms on one side of the equal sign: $0 = x^2 - 12x + 20$

STEP 4: Solve the quadratic equation (by factoring or quadratic formula): $0 = (x-10)(x-2)$
So $x = 10$ and $x = 2$

STEP 5: Test both solutions by plugging them back into the original equation!

$x = 10 : \sqrt{25} + 5 = 10$

$x = 2 : \sqrt{9} + 5 \neq 2$

So the only solution is $x = 10$