Homework: http://math.mnrt.net/

Name ________________________________ ______ raw ______ scaled ______ percent

Math 10 Trimester 2 Exam 1 (150 Points)

Equations - Roots & Coefficients, Inequalities

- **This is a take home exam. Here are the rules:**

  The exam is due at the start of class on _________________, 2012.

  You may
  [1] use your book, your notes, and a calculator while doing the exam,
  [2] use any other book while doing the exam,
  [3] use the internet to learn more about these topics while doing the exam (not recommended).

  You may not
  [1] communicate with anyone about these questions until the exams have all been collected. This includes communicating in person, in writing, over the phone, on-line.

- **Any questions about these rules, just ask me at any time. If you believe there is an error in a question, ask me about it.**

- **Please work out your solutions as rough drafts on paper other than this exam paper. When you turn in this exam (on this paper) it should be your final draft of your best work.**

- **Partial credit is given. It is to your advantage to write clear, complete, and concise solutions. Show as much detail as would be needed for a good student at your level to understand your work.**

- **Calculators are allowed, but only exact answers count. If the answer is $\sqrt{2}$, then $\sqrt{2}$ gets credit and a decimal approximation such as** 1.4142135623730950488 **gets no credit.**

- **Answers must be completely simplified. No denominators may include radical or complex numbers. All fractions reduced. Simple arithmetic must be completely performed; e.g. write 9 instead of $\sqrt{81}$ and $i\sqrt{7}$ instead of $\sqrt{-7}$.**

■ **Each problem counts 15 points. The symbol $\mathbb{C}$ denotes the set of complex numbers.**

[1] Find all cube roots, including complex roots, of -1.

[2] Solve for $x \in \mathbb{C}$, $(x^2 + 4)^2 + 5\,(x^2 + 4) = -6$

[3] Find all real numbers k, in terms of a and b, for which $a x^2 + b k x + k = 0$, $a > 0$ has two distinct real roots.

[4] Show that if the roots of a quadratic equation are complex numbers, then the product of the roots cannot be negative.

[5] Solve for $x \in \mathbb{C}$, $x^3 + x^2 - 3x - 2 = 0$.

[6] Suppose $x + 3$ is a factor of $P(x) = x^3 + a\,x^2 - 7\,x + 6$. Find the other factors of $P(x)$.

[7] When a polynomial $P(x)$ is divided by $x - 1$ the remainder is -3, and when it is divided by $x + 3$ the remainder is 1. Find the remainder when $P(x)$ is divided by $x^2 + 2x - 3$.

[8] Prove that if $\frac{1}{a+b+c} = \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$, then there are two opposite numbers among $a, \; b, \; c$ (that is, $a = -b$, $a = -c$, or $b = -c$).

[9] Prove that if $a > 1$, $b > 1$ then $a + b < 1 + a b$.

[10] Prove that for any real numbers x and y, $||x| - |y|| \leq |x + y|$.