Review for Test 3
Math 097 *Academic Systems*

Format
- The exam will be of the same format as previous exams.

Basic Content.
- You are responsible for sections 10.1, 10.2, and 10.3. I will also include as many questions from previous exams as I have space for. For this reason, I recommend that you visit the website (http://flightline.highline.edu/dwilson) and download copies of the previous exams. Make sure that you are able to work each of these problems without reference to your notes or your actual exam.
- In addition to the material covered in the class, you are responsible for all of the basic facts you have learned since kindergarten. These include the facts : $-1^2 = -1$, $\frac{1}{0}$ is undefined, and that 0^0 is also undefined.

Where You Should Be
- You should plan to finish your work on Academic Systems two days prior to the exam (or early on the day before the exam at the latest). You should plan to have your homework done by a decent hour on the day before the exam.
- After completing your homework, you should plan on spending 2 to 5 hours studying for this exam (more time is certainly appropriate when necessary).
- Additionally, I would find a few challenging problems in the book from each topic. Write these down and solve them with your book closed.
- Remember, the exam is closed book and closed note. It is also timed. I recommend that you study under the same or similar constraints.
- Can you work all the practice test problems, without notes or calculator, in 90 minutes? This is a good way to assess whether you are prepared for the exam.

Section: 10.1: Quadratic Equations I
- Solving by factoring
  - The standard form of a quadratic equation
  - Solving quadratic equations by factoring.
- Solving by square roots.
  - Square roots.
  - Solving quadratic equations using the square root property.

If it starts as an equation "=" then it should remain as such @ each line.

1.) $x^2 - 4x = 21$

$\Rightarrow x^2 - 4x - 21 = 0$

$\Rightarrow (x-7)(x+4) = 0$

$\Rightarrow x = 7 \text{ OR } x = -4$

2.) $x^2 - 44 = -7x$

$\Rightarrow x^2 + 7x - 44 = 0$

$\Rightarrow (x+11)(x-4) = 0$

$\Rightarrow x = -11 \text{ OR } x = 4$

when you root
both sides, you pick
a "$\pm$"

3.) $(x+3)^2 = 49$

$$\Rightarrow x + 3 = \pm\sqrt{49}$$

$$\Rightarrow x = -3 \pm 7$$

$$\Rightarrow x = 4 \text{ or } x = -10$$

4.) $5x^2 - 180 = 0$

$$\Rightarrow 5x^2 = 180$$

$$\Rightarrow x^2 = 36$$

$$\Rightarrow x^2 = \pm\sqrt{36}$$

$$\Rightarrow x = \pm 6$$

5.) $9x^2 - 30x + 25 = 18$ $\longleftarrow$ $9x^2 - 30x + 25$ is

of the form $a^2 - 2ab + b^2$
which equals $(a-b)^2$
where $a = 3x$ & $b = 5$

$$\Rightarrow (3x - 5)^2 = 18$$

$$\Rightarrow 3x - 5 = \pm\sqrt{18}$$

$$\Rightarrow 3x = 5 \pm 3\sqrt{2}$$

$$\Rightarrow x = \frac{5 \pm 3\sqrt{2}}{3} \text{ or } x = \frac{5}{3} \pm \sqrt{2}$$

Section 10.2: Quadratic Equations II
- Completing the square
  - Completing the square.
  - Solving quadratic equations by completing the square
  - You will be asked to solve at least one equation using this method.

6.) Solve $x^2 - 5x = 2$ by completing the square

$$\Rightarrow x^2 - 5x + \left(\frac{25}{4}\right) = 2 + \left(\frac{25}{4}\right)$$

$$\Rightarrow \left(x - \frac{5}{2}\right)^2 = \frac{8}{4} + \frac{25}{4}$$

$$\Rightarrow x - \frac{5}{2} = \pm\sqrt{\frac{33}{4}}$$

$$\Rightarrow x = \frac{5}{2} \pm \frac{\sqrt{33}}{2}$$

[scratch] $\left(-\frac{5}{2}\right)^2 = \left(\frac{25}{4}\right)$

7.) Solve $4x^2 - 6 = -3x$ by completing the square

$$\Rightarrow 4x^2 + 3x = 6$$

$$\Rightarrow x^2 + \frac{3}{4}x = \frac{6}{4} = \frac{3}{2}$$

$$\Rightarrow x^2 + \frac{3}{4}x + \left(\frac{9}{64}\right) = \frac{3}{2} + \left(\frac{9}{64}\right)$$

$$\Rightarrow \left(x + \frac{3}{8}\right)^2 = \frac{96}{64} + \frac{9}{64}$$

$$\Rightarrow x + \frac{3}{8} = \pm\sqrt{\frac{105}{64}}$$

$$\Rightarrow x = -\frac{3}{8} \pm \frac{\sqrt{105}}{8}$$

[scratch] $\left(\frac{\frac{3}{4}}{2}\right)^2 = \left(\frac{\frac{3}{4}}{2}\right)^2 = \left(\frac{3}{4} \cdot \frac{1}{2}\right)^2$

$$\text{If } ax^2 + bx^2 + c = 0 \text{ & } a \neq 0, \text{ then}$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- The Quadratic Formula
  - The quadratic formula (memorize it).
  - Solving quadratic equations using the quadratic formula
  - The discriminant
  - Strategies for solving quadratic equations.
  - <u>You will be asked to solve at least one equation using this method.</u>

8.) Solve $2x^2 - 7x + 2 = 0$ using the quadratic formula

$$\Rightarrow \quad x = \frac{7 \pm \sqrt{49 - 4(2)(2)}}{2(2)}$$

$$\Rightarrow \quad x = \frac{7 \pm \sqrt{33}}{4}$$

9.) Solve $7x - 7 = -3x^2$ using the quadratic formula

$$\Rightarrow \quad 3x^2 - 7x - 7 = 0$$

$$\Rightarrow \quad x = \frac{7 \pm \sqrt{49 - 4(3)(7)}}{2(3)}$$

$$\Rightarrow \quad x = \frac{7 \pm \sqrt{133}}{6}$$

Section 10.3: Complex Numbers
- Complex number system.
  - Imaginary numbers.
  - Complex numbers.
  - Adding and subtracting complex numbers.
  - Multiplying complex numbers.
  - Complex conjugates.
  - Dividing complex numbers.
  - Powers of i.
  - Quadratic equations with imaginary solutions.

10.) Simplify $\sqrt{-81}$

$$= \quad 9i$$

11.) Simplify $\sqrt{-6} \cdot \sqrt{-4}$

$$= i\sqrt{6} \cdot i\sqrt{4}$$

$$= 2\sqrt{6}\, i^2$$

$$= -2\sqrt{6}$$

12.) Find $5(3-6i)+3(7+2i)$

$= 15-30i+21+6i$

$= 36-24i$

13.) Find $(2-5i)(6+4i)$

$= 12+8i-30i-20i^2$

$\underbrace{\qquad}$

$+20$

$= 32-22i$

complex conjugate $\underline{\qquad}\Downarrow$

14.) Find $\dfrac{5-3i}{3+4i}$ $\cdot$ $\dfrac{3-4i}{3-4i}$

$= \dfrac{15-20i-9i+12i^2}{9-12i+12i-16i^2}$

$= \dfrac{15-29i-12}{9+16}$

$= \dfrac{3-29i}{25}$

oR

$= \dfrac{3}{25}-\dfrac{29}{25}i$ (which

is in the form

$z = a+bi$)

15.) Solve $x^2+6x+11=0$

$\Rightarrow x = \dfrac{-6\pm\sqrt{36-4(1)(11)}}{2}$

$\Rightarrow x = \dfrac{-6\pm\sqrt{8}}{2}$

$\Rightarrow x = \dfrac{-6\pm 2i\sqrt{2}}{2}$

$\Rightarrow x = -3\pm i\sqrt{2}$