Math 1111 Journal Entries **Name ________________**
Unit I (Sections 1.1-1.2, 1.4-1.6)

Respond to each item, giving sufficient detail. You may handwrite your responses with neat penmanship. *Your portfolio should be a collection of your best work and should also be very helpful to you as you prepare for exams.*

1. Complete the following 6-step process toward solving linear equations.

   (1) List any restrictions on the variable.

   (2) Clear the equations of ________________ by multiplying both sides by the least common multiple (LCM) of the denominators of all the fractions.

   (3) Remove any grouping symbols such as ________________ using the distributive property, and simplify by combining like terms.

   (4) Collect all terms containing the ________________ on one side and all remaining terms on the other side. You typically use the addition principle.

   (5) Then you typically use the multiplication principle, simplify, and solve.

   (6) Check by ________________ into the original equation.

   For the given example of a linear equation, show all steps toward the solution.

   $2x - 1 = 7$ Solution: x = _____

2. In general, write a proportion using the letters a, b, c, and d. Also show how to solve a proportion using this general form (the main principal).

   $$\frac{a}{b} = \frac{c}{d}$$ Solve by ____ .

   Also complete this example of solving a proportion involving rational expressions.

   $$\frac{x - 2}{3} = \frac{2x + 1}{4}$$ Solution: x = _____

   $4(x - 2) =$ ___________

   $4x - 8 =$ ___________

3 & 4. List the 4 algebraic methods for finding zeros of quadratic functions or solving quadratic equations, and give examples for <u>any two</u> of them.

(1) ______________________ If $x^2 = p$, then $x = \sqrt{p}$ or $x = -\sqrt{p}$.

(2) ______________________ [Uses the perfect square patterns below]

(3) Factoring/The Zero Product Property

Factoring Steps:
1. Factor out the Greatest Common Factor (GCF) of all the terms.
2. If the polynomial has:
   – two terms, check to see if it is a difference of cubes, a difference of cubes, or a sum of cubes.

$a^2 - b^2 =$ ________________________

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

   – three terms, guess (. . . and check with F O I L) or use grouping. P.S. There is a special perfect square situation.

$$a^2 + 2ab + b^2 = (a + b)^2$$

$a^2 - 2ab + b^2 =$ ____________

   – four or more terms, try grouping.

3. Be persistent and careful to continue the process until the polynomial is factored <u>completely</u>!

(4) The Quadratic Formula: Consider the quadratic equation $ax^2 + bx + c = 0$, where a, b, and c are real numbers and $a \neq 0$. If $b^2 - 4ac \geq 0$, the real solution(s) of this equation are given by the formula:

Examples:

(a) $x^2 - 4x - 5 = 0$ (b) $x^2 - 9 = 0$ (c) $2x^2 + x - 5 = 0$

$a = 1$, $b = -4$, $c = -5$

In the complex number system, consider a quadratic equation $ax^2 + bx + c = 0$ with real coefficients a, b, and c.

(1) If $b^2 - 4ac > 0$, the equation has two distinct (unequal) ____________ solutions.

(2) If $b^2 - 4ac = 0$, the equation has ____________ repeated real solution (or root).

(3) If ____________< 0, the equation has two distinct complex (or imaginary) solutions that are not real. They are ____________ of each other. The imaginary unit $i = \sqrt{-1}$.

5. Solving radical equations:

When solving radical equations, the main concept is to raise both sides of the equation to the power equal to the __________ of the radical, and then it is critical to __________ for extraneous solutions.

Solve the following two radical equations. Show each step in the process.

(a) $\sqrt{x-4} = 5$ (b) $\sqrt[3]{x+1} = 2$

6. Solving linear inequalities:

Complete the following properties. These principles apply to other inequalities (>, ≥, ≤).

If a < b, then a + c < b + c and a – c < b – c whether c is positive, negative, or zero.

If a < b and c is positive, then $a \cdot c < b \cdot c$ and $\frac{a}{c} < \frac{b}{c}$.

BUT, If a < b and c is negative, then __________ and $\frac{a}{c} > \frac{b}{c}$.

True or false.

(a) x – 4 < 2 has the solution {x| x < 6}. __________

(b) x + 4 ≥ -2 has the solution (-∞, -6]. __________

(c) -2x < 10 has the solution (-∞, -5]. __________

(d) $\frac{x}{4} \geq -1$ has the solution [-4, ∞). __________

7. Absolute value equations:

(a) If a is a positive number, then $|u| = a$ is equivalent to u = a or ___________ .

Solve the following absolute value equation with a > 0, and show all the steps toward your solution.

$$|x-4| = 5$$

(b) If a is zero, how many solutions are there? ___________

Solve the following absolute value equation with a = 0, and show all the steps toward your solution.

$$|x+3| = 0$$

(c) If a is negative, then $|u| = a$ has no solution.

Give an example of an absolute value equation with a < 0. ______________________

8. Absolute value inequalities:

(a) If a is a positive number, then $|u| \le a$ is equivalent to ______________________ .
This works similarly for $|u| < a$.

Solve for x: $|x-4| < 5$. Include a graph, and write your answer in interval notation.

(b) If a is a positive number, then $|u| \ge a$ is equivalent to ______________________ .
This works similarly for $|u| > a$.

Solve for x: $|x-4| > 5$. Include a graph, and write your answer in interval notation.

9. Applications:

In this unit, we have worked with linear equations (e.g., temperature conversion problems involving ˚C and ˚F, an employee's hourly salary with overtime hours), linear inequalities (e.g., a weighted average grade calculation problem), and quadratic equations (e.g., a variety of projectile motion problems). Choose one, write the problem, and show each step toward the solution.

Problem:

Work:

Solution:

10. Write a few sentences describing something you learned that was new for you in class this unit. You may include a favorite activity, an interesting application, a teaching and learning technique, or a specific concept that you better understand.

Do your best! Rise to the challenge! Live and learn!