

FINAL EXAM

Math 110 (Doherty)

Name _____

INSTRUCTIONS: PLEASE READ THIS FIRST:

1. Make sure you have a complete exam. The exam has 10 pages, counting this cover page.
2. Show all your work. Use the back of an adjacent page if you need more space.
3. You are not allowed to use a calculator of any kind.
4. If you have questions, raise your hand and I will assist you as soon as possible.
5. The quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Good Luck.

Problem	Total Points	Score
1	21	
2	6	
3	11	
4	15	
5	4	
6	6	
7	10	
8	6	
9	5	
10	6	
11	10	
Total	100	

1. Solve each inequality. State the solution set using interval notation, and graph it on a number line.

(a) (5 pts) $-2 \leq \frac{3x - 2}{10} < 1$

(b) (5 pts) $y^2 - 3y > 10$

(c) (5 pts) $2z - 3z^2 \geq 0$

(d) (6 pts) $x^3 - 3x^2 - 4x + 12 \leq 0$

2. (5 pts) Reduce the fraction

$$\frac{(x^3 y^{-1} z^2)^{1/3}}{x^{1/2} y z^{2/3}}$$

3. Solve each quadratic and state the solution set, including complex solutions. You may use any method except the quadratic formula. Complex solutions should be written using i ; radicals should be simplified.

(a) (5 pts) $6 - \frac{1}{2}x^2 = 0$

(b) (6 pts) $2x^2 + 12x = -26$

4. Solve and state the solution set. You may use any method to solve quadratic equations you encounter, including the quadratic formula. Check for extraneous solutions to receive full credit.

(a) (6 pts) $\sqrt{3x+4} - \sqrt{x+5} = 1$

(b) (4 pts) $(z-4)^{-2/3} = \frac{1}{4}$

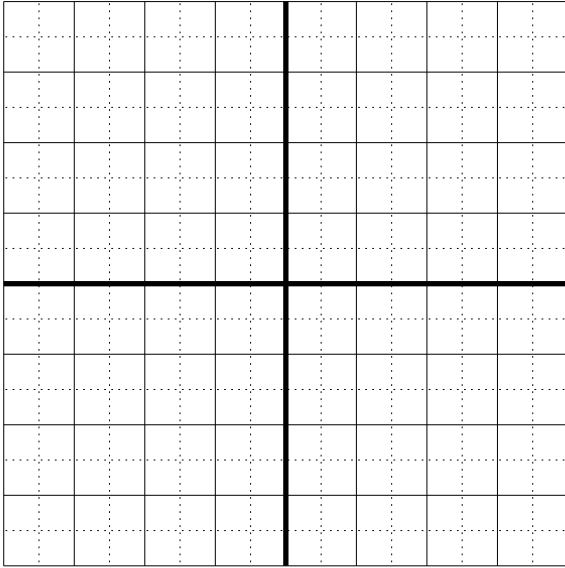
(c) (5 pts) $\frac{y}{y+4} - \frac{2}{y+1} = \frac{-2}{y^2+5y+4}$

5. (4 pts) Using a graph, find the solution set for the system of equations

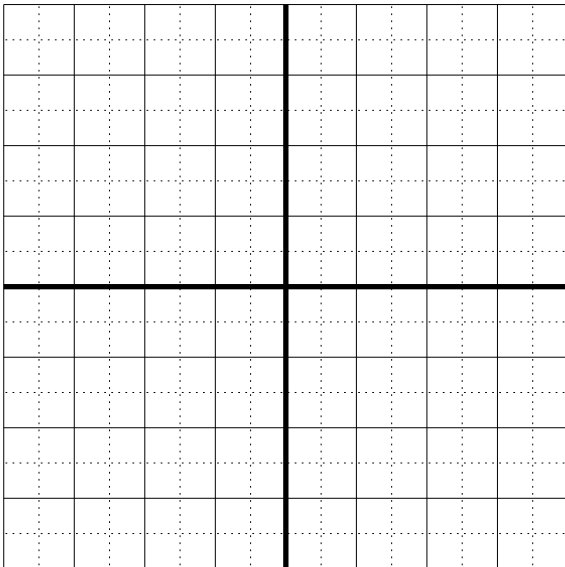
$$3x - 3y = 9$$

$$5y - 5x = 10.$$

Is this system dependent, independent, or inconsistent?



6. (6 pts) Graph the solution set to the system of inequalities $x - 4y < 0$ and $3x + 2y \geq 6$ on the axes provided. Clearly indicate which region is the solution set.



7. (5 pts each) Determine the solution set to each system of equations. Classify each system as independent, dependent, or inconsistent.

(a)

$$\begin{aligned}\frac{1}{3}x - \frac{1}{6}y &= \frac{1}{3} \\ \frac{1}{6}x + \frac{1}{4}y &= 0\end{aligned}$$

(b)

$$\begin{aligned}2(y - 5) + 4 &= 3(x - 6) \\ 3x - 2y &= 12\end{aligned}$$

8. (6 pts) Simplify the complex fraction

$$\frac{\frac{4}{y} - \frac{y+4}{y-3}}{\frac{2}{y-3} + \frac{y+1}{y}}$$

9. (5 pts) Rewrite $\frac{-x^3 - x + 2}{x + 3}$ as quotient + $\frac{\text{remainder}}{\text{divisor}}$.

10. (6 pts) Set up an equation for the following word problem, but *do not solve it*:

Homer can row his boat 17 miles in the same time it takes Marge to cover 42 miles in her motorboat. If Marge's boat travels 15 mph faster than Homer's, how fast is Homer rowing his boat? (Stop once you have the equation to solve!)

11. (5 pts each) Perform the indicated operations. Your final answers must be a single fraction in lowest terms.

(a) $\frac{5x}{3x^2y} + \frac{7a^3}{6a^2x} + 2$

(b) $\frac{x-3}{x^2+3x+2} \div \frac{3x-9}{x^2-4}$

Extra Credit: Starting from $ax^2 + bx + c = 0$, derive the quadratic formula by completing the square. Alternatively, provide a proof (with picture) of the Pythagorean Theorem.