

Math 1120F - Exam 2

Name: KEY

Friday, November 7, 2014
Time: 30 minutes
Instructor: Brittany Cuchta

Instructions:

- Do not open the exam until I say you may.
- All cell phones and other electronic noisemaking devices must be turned off or completely silenced (i.e., not on vibrate) for the duration of the exam.
- **No calculators** are allowed on the exam.
- The exam *must* be taken in pencil. Using a pen on the exam will result in the loss of points.
- Failure to follow directions specific to a problem will result in the loss of points.
- Circle or box your final answer where appropriate. Put your final answer in the provided space when available. Failure to do so will result in points being deducted.
- Show **all** work. Full credit will only be given if work is shown which **fully and clearly** justifies your answer. I reserve the right to not grade a problem which I cannot read.
- Answers must be exact (like $\sqrt{2}$), not approximate (like 1.414), unless a problem specifically indicates otherwise.
- All final answers must be simplified unless otherwise specified. **Rationalization is not required unless otherwise specified.**
- If you run out of room, use the back of the page and indicate this on the question.
- As always, you are expected to exhibit academic integrity during the exam.

Page:	1	2	3	Total
Points:	20	15	15	50
Score:				

1. (6 points) Circle true or false for the following questions. Partial credit will not be given.

(a) True False : If $|u| \leq a$, $a > 0$ then $u \geq a$ or $u \leq -a$.

(b) True False : The complex conjugate of 3 is -3 .

(c) True False : Some equations have no solution.

2. (6 points) State the type of solution(s) expected given the following:

(a) $b^2 - 4ac = 0$ one real solution

(b) $b^2 - 4ac < 0$ two complex conjugates

(c) $b^2 - 4ac > 0$ two real solutions

3. (5 points) Set up, but do not solve, the following partial fraction decomposition.

$$\frac{4x^3}{(x+3)(x+2)(x-1)(x^2+x+1)} = \frac{4x^3}{(x+3)(x^2+x-2)(x^2+x+1)} = \frac{A}{x+3} + \frac{B}{x+2} + \frac{C}{x-1} + \frac{Dx+E}{x^2+x+1}$$

4. (3 points) Write the following in $a + bi$ form:

$$\frac{3-i}{3+i} \cdot \frac{3-i}{3-i} = \frac{9-6i+i^2}{9+1} = \frac{9-6i-1}{10} = \frac{8-6i}{10} = \frac{8}{10} - \frac{6}{10}i$$

$$\frac{4}{5} - \frac{3}{5}i$$

5. Solve the following inequalities. Express your answer in interval notation.

(a) (5 points) $|5 - 2x| \leq 9$

$$5 - 2x \leq 9 \quad \text{or} \quad 5 - 2x \geq -9$$

$$-2x \leq 4$$

$$x \geq -2$$

$$-2x \geq -14$$

$$x \leq 7$$

Solution: $[-2, 7]$

(b) (5 points) $\frac{1}{2} + \left| \frac{2x - 1}{3} \right| \leq 1$

$$\left| \frac{2x - 1}{3} \right| \leq \frac{1}{2}$$

$$\frac{2x - 1}{3} \leq \frac{1}{2} \quad \text{or} \quad \frac{2x - 1}{3} \geq -\frac{1}{2}$$

$$2x - 1 \leq \frac{3}{2}$$

$$2x - 1 \geq -\frac{3}{2}$$

$$2x \leq \frac{5}{2}$$

$$2x \geq -\frac{1}{2}$$

$$x \leq \frac{5}{4}$$

$$x \geq -\frac{1}{4}$$

Solution: $[-\frac{1}{4}, \frac{5}{4}]$

6. (5 points) Jack and Sally have been asked to mow the lawn. If Jack can finish the job in 4 hours and Sally can in 5 hours, how long will it take them to finish the job together?

Jack's work in 1 hr: $\frac{1}{4}$
 Sally's work in 1 hr: $\frac{1}{5}$

$$\frac{1}{4} + \frac{1}{5} = \frac{1}{t}$$

$$\frac{5}{20} + \frac{4}{20} = \frac{1}{t}$$

$$\frac{9}{20} = \frac{1}{t}$$

$$t = \frac{20}{9}$$

\therefore they will finish
 in $\frac{20}{9}$ hours

7. Find all solutions to the following equations using any method. If there is no solution, state so.

(a) (5 points) $\sqrt{3x+1} - \sqrt{x} = 3$

$$\sqrt{3x+1} = 3 + \sqrt{x}$$

$$3x+1 = 9 + 6\sqrt{x} + x$$

$$2x-8 = 6\sqrt{x}$$

$$x-4 = 3\sqrt{x}$$

$$x^2 - 8x + 16 = 9x$$

$$x^2 - 17x + 16 = 0$$

$$(x-1)(x-16) = 0$$

$$x=1, x=16$$

Check: $\sqrt{3(1)+1} - 1 = \sqrt{4} - 1 \neq 3$
 $\sqrt{3(16)+1} - 4 = \sqrt{49} - 4 = 3 \checkmark$

(b) (5 points) $u^4 + 2u^2 - 8 = 0$

Let $x = u^2$.

$$x^2 + 2x - 8 = 0$$

$$(x-2)(x+4) = 0$$

$$x=2 \quad x=-4$$

$$u^2 = 2 \quad u^2 = -4$$

$$u = \pm\sqrt{2} \quad u = \pm 2i$$

Solution: $u = \pm\sqrt{2}, \pm 2i$

(c) (5 points) $\frac{6x}{x^2-9} = \frac{18}{x^2-9} - \frac{2}{x+3}$

$$D = \{x \mid x \neq 3, -3\}$$

$$6x = 18 - 2(x-3)$$

$$6x = 18 - 2x + 6$$

$$8x = 24$$

$$x=3 \quad \therefore \text{no solution}$$

Solution: no solution