

Math 1151, Exam 3 (in-class)  
April 30, 2010

Name: \_\_\_\_\_

Discussion Section: \_\_\_\_\_

Discussion TA: \_\_\_\_\_

This exam has 8 multiple-choice problems, each worth 5 points. When you have decided on a correct answer to a given question, circle the answer in this booklet. There is no partial credit for the multiple-choice problems. This exam has 4 open-ended problems, whose point-values are given in the problem. Make sure to show all your work and circle your final answer. This exam is closed book and closed notes. You may use a scientific calculator but not a graphing calculator.

**Formulas:**

$$\sum_{k=1}^n (a_1 + (k-1)d) = \frac{n}{2}(a_1 + a_n)$$

$$\sum_{k=1}^n a_1 r^{k-1} = a_1 \left( \frac{1-r^n}{1-r} \right)$$

1. For the vector  $v = 3\hat{i} - 3\sqrt{3}\hat{j}$ , what is  $\hat{v}$ ?

(a)  $\hat{v} = \frac{1}{2}\hat{i} - \frac{\sqrt{3}}{2}\hat{j}$

(b)  $\hat{v} = \frac{1}{12}\hat{i} - \frac{\sqrt{3}}{12}\hat{j}$

(c)  $\hat{v} = \frac{3}{3-\sqrt{3}}\hat{i} - \frac{3\sqrt{3}}{3-\sqrt{3}}\hat{j}$

(d)  $\hat{v} = -\frac{1}{6}\hat{i} + \frac{\sqrt{3}}{6}\hat{j}$

2. Find the equation for the parabola with focus  $(4, 0)$  and directrix  $x = -4$ .

(a)  $x^2 = 16y$

(b)  $x^2 = -4y$

(c)  $y^2 = 16x$

(d)  $y^2 = -16x$

3. Find the vertices of the hyperbola

$$\frac{y^2}{9} - \frac{x^2}{16} = 1$$

(a)  $(0, \pm 3)$

(b)  $(0, \pm 4)$

(c)  $(\pm 3, 0)$

(d)  $(\pm 5, 0)$

4. What is the value of the sum  $\sum_{k=1}^5 (2k + 3)$  ?

(a) 13

(b) 33

(c) 45

(d)  $10k + 3$

5. Which best describes the following system of equations?

$$\begin{cases} 2x + 3y = 1 & (1) \\ -10x - 15y = -5 & (2) \end{cases}$$

- (a) inconsistent
- (b) consistent, independent
- (c) consistent, dependent
- (d) none of the above

6. Which best describes the sequence  $3, \frac{6}{5}, \frac{12}{25}, \frac{24}{125}, \dots$ ?

- (a) Fibonacci sequence
- (b) arithmetic sequence
- (c) geometric sequence
- (d) none of the above

7. Find the sum:  $4 + 11 + 18 + 25 + \dots + 697$ .

- (a) 35,050
- (b) 35,250
- (c) 70,100
- (d) 377,510

8. Find the sum:  $\sum_{k=1}^{\infty} 5 \cdot \left(\frac{2}{3}\right)^{k-1}$ .

- (a)  $\frac{5}{3}$
- (b)  $\frac{15}{2}$
- (c) 15
- (d) The series is divergent.

9. (10 points) For the vectors  $v = 2\hat{i} + 3\hat{j}$ , and  $w = -\hat{i} + 3\hat{j}$ ,
- (a) Write  $v$  as the sum of two vectors  $v_1$  and  $v_2$ , where  $v_1$  is in the direction of  $w$  and  $v_2$  is orthogonal to  $w$ .
- (b) Graph  $v$ ,  $v_1$ ,  $v_2$ , and  $w$  on the same set of axes.

10. (10 points) For the conic section with the following equation,

$$4(x + 2)^2 + 25(y - 1)^2 = 100$$

- (a) Find the center, foci, and vertices.

- (b) Graph the conic section.

11. (20 points) For  $P(x) = x^3 - 3x^2 + 7x - 5$ .

(a) List all the possible rational roots of  $P(x)$ .

(b) Factor  $P(x)$  over the real numbers.

(c) Factor  $P(x)$  over the complex numbers.

12. (20 points) Solve the system of equations:

$$\begin{cases} x + y - z = -1 & (1) \\ 4x - 3y + 2z = 16 & (2) \\ 2x - 2y - 3z = 5 & (3) \end{cases}$$

Is this system consistent or inconsistent? If consistent, are the equations dependent or independent?

*Scratch paper. (If you want your work on this page to be graded, make sure to label your work according to the problem you're solving, and make sure to write a note next to the original problem.)*