

**MATH 151, FALL 2010  
COMMON EXAM I - VERSION A**

LAST NAME, First name (print): \_\_\_\_\_

INSTRUCTOR: \_\_\_\_\_

SECTION NUMBER: \_\_\_\_\_

UIN: \_\_\_\_\_

SEAT NUMBER: \_\_\_\_\_

**DIRECTIONS:**

1. The use of a calculator, laptop or computer is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your ScanTron using a No. 2 pencil. The scantrons will not be returned, therefore *for your own records, also record your choices on your exam!*
3. In Part 2 (Problems 11-16), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
4. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

**“An Aggie does not lie, cheat or steal, or tolerate those who do.”**

Signature: \_\_\_\_\_

**DO NOT WRITE BELOW!**

Question	Points Awarded	Points
1-10		40
11		10
12		6
13		10
14		10
15		10
16		14
		100

**PART I: Multiple Choice**

1. (4 pts) Find the vector  $\vec{a}$  that has magnitude  $|\vec{a}| = 12$  and makes an angle of  $300^\circ$  with the positive  $x$ -axis.

- (a)  $\langle 6, 6\sqrt{3} \rangle$
- (b)  $\langle 6\sqrt{3}, 6 \rangle$
- (c)  $\langle 6, -6\sqrt{3} \rangle$
- (d)  $\langle 6\sqrt{3}, -6 \rangle$
- (e)  $\langle -6\sqrt{3}, -6 \rangle$

2. (4 pts)  $\lim_{t \rightarrow \infty} \frac{6t^2 + 3t}{(3-t)(2t+4)} =$

- (a) 3
- (b) 0
- (c) 6
- (d) -6
- (e) -3

3. (4 pts) Find all vertical asymptotes for  $f(x) = \frac{x^2 - 1}{x^3 + x^2}$ .

- (a)  $x = 0$
- (b)  $x = 1, x = -1$
- (c)  $x = 0, x = 1$
- (d)  $x = 1$
- (e)  $x = 0, x = -1$

4. (4 pts) A force  $\vec{F} = 2\vec{i} + 6\vec{j}$  moves an object from the point  $P(1, 3)$  to the point  $Q(3, 7)$ . How much work is done if the force is measured in pounds and the distance is measured in feet?

- (a) 19 foot pounds
- (b) 28 foot pounds
- (c) 68 foot pounds
- (d) 45 foot pounds
- (e) 32 foot pounds

5. (4 pts) Find the equation of the tangent line to the graph of  $f(x) = \frac{x}{1+2x}$  at  $x = 1$ .

- (a)  $y - \frac{1}{3} = -\frac{1}{9}(x - 1)$
- (b)  $y - \frac{2}{3} = \frac{1}{9}(x - 1)$
- (c)  $y - \frac{1}{3} = -\frac{4}{9}(x - 1)$
- (d)  $y = \frac{1}{9}(x - 1)$
- (e)  $y - \frac{1}{3} = \frac{1}{9}(x - 1)$

6. (4 pts) The parametric equations  $x = 3 + \sin t$ ,  $y = -2 + \cos t$  describe

- (a) A circle
- (b) A parabola
- (c) An ellipse with major axis 3 and minor axis 2
- (d) A line
- (e) A hyperbola

7. (4 pts) Find the value of  $a$  and  $b$  that makes  $f(x) = \begin{cases} -x + a & \text{if } x \leq 1 \\ bx^2 + 3 & \text{if } x > 1 \end{cases}$  continuous and differentiable at  $x = 1$ .

(a)  $a = \frac{5}{2}$  and  $b = -\frac{3}{2}$

(b)  $a = \frac{9}{2}$  and  $b = \frac{1}{2}$

(c)  $a = 0$  and  $b = -4$

(d)  $a = \frac{5}{2}$  and  $b = -\frac{1}{2}$

(e)  $a = \frac{7}{2}$  and  $b = -\frac{1}{2}$

8. (4 pts) What is the slope of the line that passes through the point  $(4, 7)$  and is perpendicular to the vector  $\langle -5, 6 \rangle$ ?

(a)  $-\frac{4}{7}$

(b)  $\frac{5}{6}$

(c)  $\frac{6}{5}$

(d)  $\frac{7}{4}$

(e)  $-\frac{6}{5}$

9. (4 pts) Which of the following intervals contains a solution to the equation  $x^3 + 2x + 2 = 7$ ?

(a)  $[1, 2]$

(b)  $[-2, -1]$

(c)  $[-1, 0]$

(d)  $[0, 1]$

(e)  $[2, 3]$

10. (4 pts) If  $\triangle ABC$  is an equilateral triangle with sides of length 2, compute  $\overline{BA} \cdot \overrightarrow{BC}$ .

(a)  $4\sqrt{3}$

(b) 2

(c) 1

(d) 4

(e)  $2\sqrt{3}$

## PART II WORK OUT

**Directions:** Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

11. (10 pts) Find the distance from the point  $(1, 7)$  to the line  $y = 2x + 3$ .

12. (6 pts) Find the coordinates of the intersection point of the lines L1 and L2 given below.

L1:  $x = -1 - 2t, y = 2 + t$

L2:  $x = 15 - 3w, y = 3 + 6w$

13. For each of the following limits, either calculate the limit, if it exists, or else explain why the limit does not exist.

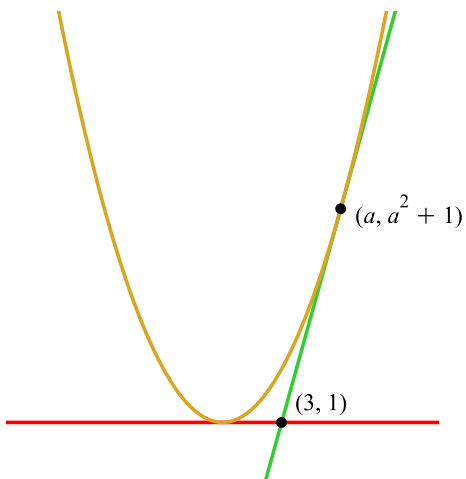
(i) (4 pts)  $\lim_{x \rightarrow 0^+} \frac{x^2 + 2x}{|x|}$

(ii) (4 pts)  $\lim_{x \rightarrow 0^-} \frac{x^2 + 2x}{|x|}$

(iii) (2 pts)  $\lim_{x \rightarrow 0} \frac{x^2 + 2x}{|x|}$

14. (10 pts) Using the *definition of the derivative*, find  $f'(x)$  for  $f(x) = \frac{4}{x+1}$ .

15. (10 pts) The horizontal line through the point  $(3, 1)$  is tangent to the parabola  $y = x^2 + 1$ . We see from the figure below that there is a second line tangent to the parabola at  $(a, a^2 + 1)$  that also passes through the point  $(3, 1)$ . Find the value of  $a$ .



16. (a) (8 pts) Find  $\lim_{x \rightarrow 2} \frac{x - \sqrt{3x - 2}}{x^2 - 4}$

(b) (6 pts) Is there a value of  $a$  for which  $\lim_{x \rightarrow -3} \frac{x^2 + ax + a + 5}{x^2 - 2x - 15}$  exists? If so, find the value of  $a$ . If not, explain why.

**End of Exam**