

**MATH 151, FALL 2009  
COMMON EXAM I - VERSION B**

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. *For your own records, also record your choices on your exam!*
3. In Part 2 (Problems 11-15), 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		50
11		10
12		10
13		10
14		10
15		10
		100

**PART I: Multiple Choice**

1. (5 pts) Find a unit vector perpendicular to the line described by the parametric equations  $x = 3t + 1$  and  $y = 2t + 5$ .

(a)  $\left\langle \frac{3}{\sqrt{13}}, \frac{2}{\sqrt{13}} \right\rangle$

(b)  $\left\langle -\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}} \right\rangle$

(c)  $\langle 3, 2 \rangle$

(d)  $\left\langle \frac{2}{\sqrt{13}}, -\frac{3}{\sqrt{13}} \right\rangle$

(e)  $\langle 2, -3 \rangle$

2. (5 pts)  $\lim_{x \rightarrow 0} \frac{\sqrt{9+x} - 3}{x} =$

(a)  $\frac{1}{6}$

(b) 0

(c) 1

(d)  $-\frac{1}{6}$

(e) The limit does not exist.

3. (5 pts) If  $H(x) = x^2 f(x)$ , find  $H'(2)$  if it is known that  $f(2) = 4$  and  $f'(2) = -3$ .

(a) 16

(b) -12

(c) 4

(d) -22

(e) -28

4. (5 pts) A wagon is pulled a distance of 25 feet along a horizontal path by a constant force of 8 pounds. The handle of the wagon is at an angle of  $30^\circ$  above the horizontal. How much work is done?

- (a)  $100\sqrt{3}$  foot pounds
- (b)  $100\sqrt{2}$  foot pounds
- (c) 200 foot pounds
- (d) 100 foot pounds
- (e)  $200\sqrt{3}$  foot pounds

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

- (a)  $y - \frac{2}{3} = \frac{5}{9}(x - 2)$
- (b)  $y - \frac{2}{3} = \frac{1}{9}(x - 2)$
- (c)  $y - \frac{2}{3} = -\frac{1}{9}(x - 2)$
- (d)  $y = \frac{1}{9}(x - 2)$
- (e)  $y - \frac{5}{9} = \frac{5}{9}(x - 2)$

6. (5 pts) Which of the following is a cartesian equation for the curve described by the parametric equations  $x = 4 + \sin t$ ,  $y = \cos t$ ,  $0 \leq t \leq 2\pi$ ?

- (a)  $x^2 + y^2 = 1$
- (b)  $(x - 4)^2 + y^2 = 1$
- (c)  $x^2 + (y - 4)^2 = 1$
- (d)  $(x - 4)^2 - y^2 = 1$
- (e)  $x^2 - (y - 4)^2 = 1$

7. (5 pts) Where is  $f(x) = \begin{cases} 2x + 1 & \text{if } x \leq -1 \\ x^2 - 2 & \text{if } -1 < x \leq 2 \\ \frac{1}{x} + \frac{1}{2} & \text{if } x > 2 \end{cases}$  not continuous?

- (a)  $x = 2$
- (b)  $x = -1$
- (c)  $x = -1$  and  $x = 2$
- (d)  $x = 0$ ,  $x = -1$  and  $x = 2$
- (e)  $x = 0$  and  $x = 2$

8. (5 pts)  $\lim_{x \rightarrow -3^-} \frac{x-1}{x^2(x+3)} =$

- (a)  $\frac{1}{3}$
- (b)  $-\infty$
- (c)  $\infty$
- (d)  $-\frac{1}{3}$
- (e) 0

9. (5 pts) Which of the following intervals contains a solution to the equation  $x^3 + x^2 = 3x + 10$ ?

- (a)  $(-1, 0)$
- (b)  $(-2, -1)$
- (c)  $(1, 2)$
- (d)  $(0, 1)$
- (e)  $(2, 3)$

10. (5 pts) Where is  $f(x) = |x^2 - 16|$  not differentiable?

- (a)  $x = 0$
- (b)  $x = 8$
- (c)  $x = \pm 4$
- (d)  $x = 0$ ,  $x = \pm 4$
- (e)  $f(x)$  is differentiable everywhere because it is a polynomial.

## 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  $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 + 5x})$ .

12. (10 pts total)

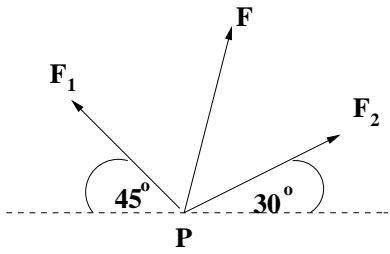
(i) (4 pts) Find the cosine of the angle between the vectors  $\langle 1, 2 \rangle$  and  $\langle 3, 4 \rangle$ .

(i) (3 pts) Find the scalar projection of  $\langle 1, 2 \rangle$  onto  $\langle 3, 4 \rangle$ .

(ii) (3 pts) Find the vector projection of  $\langle 1, 2 \rangle$  onto  $\langle 3, 4 \rangle$ .

13. (10 pts) Using the *definition of the derivative*, find  $f'(x)$  for  $f(x) = \frac{3}{x-2}$ .

14. (10 pts) Two forces  $\mathbf{F}_1$  and  $\mathbf{F}_2$  with magnitudes 10 and 8 pounds respectively act on an object at a point  $P$  as shown. Find the magnitude of the resultant force  $\mathbf{F}$  acting on the object. Do not simplify.



15. (a) (5 pts) Find  $\lim_{x \rightarrow 2^-} \frac{x-2}{|x-2|}$

(b) (5 pts) Is there a value of  $a$  for which  $\lim_{x \rightarrow 1} \frac{3x^2 + ax + a + 5}{x^2 + 2x - 3}$  exists? If so, find the value of  $a$ . If not, explain why.

**End of Exam**