

**MATH 151, FALL 2010  
COMMON EXAM II - 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 1-11), 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 12-16), 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
1-11		44
12		12
13		10
14		10
15		12
16		12
		100

PART I: Multiple Choice

1. (4 pts)  $\lim_{t \rightarrow 0} \frac{t^3}{\sin^3(2t)} =$

- (a) 8
- (b)  $\frac{1}{8}$
- (c)  $\frac{1}{2}$
- (d) 2
- (e) 0

2. (4 pts) Find  $f' \left( \frac{\pi}{4} \right)$  for  $f(x) = x \sin x \cos x$ .

- (a)  $\frac{1}{2} + \frac{\sqrt{2}\pi}{4}$
- (b)  $\frac{1}{2} + \frac{\pi}{4}$
- (c)  $\frac{1}{2}$
- (d)  $\frac{1}{2} - \frac{\sqrt{2}\pi}{8}$
- (e)  $\frac{1}{2} + \frac{\sqrt{2}\pi}{8}$

3. (4 pts) If  $g(x) = f(x^3) + (f(x))^3$ ,  $f(1) = 2$  and  $f'(1) = -3$ , find  $g'(1)$ .

- (a)  $g'(1) = -45$
- (b)  $g'(1) = -33$
- (c)  $g'(1) = -39$
- (d)  $g'(1) = 27$
- (e)  $g'(1) = 3$

4. (4 pts) Find the slope of the tangent line to the parametric curve  $x = e^{-5t}$ ,  $y = t \cos t$  at the point  $(1, 0)$ .
- (a)  $m = -1$
  - (b)  $m = -5$
  - (c)  $m = 5$
  - (d)  $m = \frac{1}{5}$
  - (e)  $m = -\frac{1}{5}$
5. (4 pts) If  $g(x)$  is the inverse of  $f(x) = \sqrt{x^3 + x + 6}$ , find  $g'(4)$ .
- (a) 8
  - (b)  $\frac{13}{4}$
  - (c)  $\frac{1}{4}$
  - (d)  $\frac{13}{8}$
  - (e)  $\frac{8}{13}$
6. (4 pts) The graph of the curve  $y = x + \frac{1}{3} \cos(3x)$  has a horizontal tangent at  $x =$
- (a)  $\frac{\pi}{12}$
  - (b)  $\frac{\pi}{6}$
  - (c)  $\frac{\pi}{3}$
  - (d)  $\frac{\pi}{2}$
  - (e)  $\frac{\pi}{4}$
7. (4 pts) An object is moving according to the equation  $s(t) = t^3 - 9t^2 + 15t + 8$ . When is the object moving in the negative direction?
- (a)  $0 < t < 1$  and  $t > 5$
  - (b)  $0 < t < 2$  and  $t > 3$
  - (c)  $0 < t < 5$
  - (d)  $1 < t < 5$
  - (e)  $1 < t < 6$

8. (4 pts)  $\lim_{x \rightarrow 4^-} \left(\frac{1}{3}\right)^{\frac{x}{x-4}} =$

- (a) 1
- (b) 0
- (c) -1
- (d)  $\infty$
- (e)  $-\infty$

9. (4 pts) Find the slope of the tangent line to the curve  $y^3 - xy = 2x + 4$  at the point  $(1, 2)$ .

- (a)  $\frac{4}{11}$
- (b) 8
- (c)  $\frac{2}{11}$
- (d)  $\frac{1}{3}$
- (e)  $\frac{5}{3}$

10. (4 pts) Find the linear approximation,  $L(x)$ , of  $f(x) = \sqrt{x^2 + 9}$  at  $x = -4$ .

- (a)  $L(x) = -\frac{4}{5}x + \frac{9}{5}$
- (b)  $L(x) = \frac{1}{5}x + \frac{29}{5}$
- (c)  $L(x) = -\frac{4}{5}x + \frac{41}{5}$
- (d)  $L(x) = \frac{1}{5}x + \frac{4}{5}$
- (e)  $L(x) = -\frac{4}{5}x - \frac{16}{5}$

11. (4 pts) Find a unit tangent vector to the curve  $\mathbf{r}(t) = \left\langle \frac{2}{t} + 1, t\sqrt{t} + \frac{t}{2} \right\rangle$  at  $t = 1$ .

- (a)  $\left\langle -\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}} \right\rangle$
- (b)  $\left\langle -\frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$
- (c)  $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$
- (d)  $\left\langle -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$
- (e)  $\left\langle \frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$

## 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.

12. Given that  $s(t) = e^{-3t} \cos(2t)$  is the equation of motion of an object, find

(i) (6 pts) The velocity at time  $t$ .

(ii) (6 pts) The acceleration at time  $t$ .

13. (10 pts) Find the equation of the tangent line to the curve  $y = \sqrt{x + \sqrt{8 + x}}$  at  $x = 1$ .

14. (10 pts) Use differentials (or a linear approximation) to estimate  $(1.02)^{10}$ .

15. (12 pts) The volume of a cube is increasing at a rate of 10 cubic centimeters per minute. How fast is the surface area increasing when the edge length is 30 cm? Note: The volume of a cube is  $V = x^3$  and the surface area of a cube is  $A = 6x^2$ .

16. Find  $f'(t)$  for the following functions.

(i) (6 pts)  $f(t) = \tan^3(t^2 + a^2)$

(ii) (6 pts)  $f(t) = e^{t+\sqrt{t}}$