

**MATH 151, SPRING 2010  
COMMON EXAM II - 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 1-12), 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 13-17), 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 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: \_\_\_\_\_

1. At which point does the curve parametrized by  $x = t^2 + 4t + 3$ ,  $y = t^2 - 6t + 5$  have a vertical tangent?

- (a)  $(-3, -1)$
- (b)  $(-1, 21)$
- (c)  $(0, 12)$
- (d)  $(24, -4)$
- (e)  $(5, 1)$

2. Given  $f(x) = \frac{x+2}{5x-3}$ , what is  $f^{-1}$ ?

- (a)  $\frac{30x+15}{6x-10}$
- (b)  $\frac{3x-5}{2x+1}$
- (c)  $\frac{5x-3}{x+2}$
- (d)  $\frac{3x+2}{5x-1}$
- (e)  $\frac{5x+1}{3x-2}$

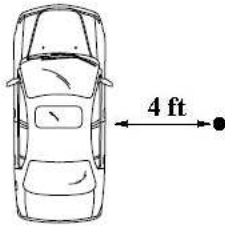
3. Given  $f(x) = xe^x$ , what is  $f^{(60)}(x)$  (the 60th derivative of  $f$ )?

- (a)  $xe^x + 60$
- (b)  $60xe^x$
- (c)  $(x+60)e^x$
- (d)  $(x-60)e^x$
- (e)  $e^x$

4. What is the slope of the line tangent to the curve parametrized by  $x = t^2 - 3t$ ,  $y = \sqrt{2t + 1}$  at the point  $(4, 3)$ ?

- (a) 15
- (b)  $3\sqrt{7}$
- (c)  $\frac{5}{3}$
- (d)  $\frac{1}{3\sqrt{7}}$
- (e)  $\frac{1}{15}$

5. A car traveling at a speed of 120 ft/sec passes a man standing 4 feet from the side of the road (See figure below). How fast is the distance directly between the car and the man changing when that distance is 5 feet?



- (a) 72 ft/sec
- (b)  $\frac{483}{5}$  ft/sec
- (c)  $\frac{600}{\sqrt{34}}$  ft/sec
- (d)  $\frac{600}{\sqrt{41}}$  ft/sec
- (e) 96 ft/sec

6. Compute  $\lim_{x \rightarrow 0} \frac{4 \sin(2x) + x}{5x}$

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

(b) 0

(c)  $\frac{9}{5}$

(d)  $\frac{7}{5}$

(e)  $\frac{8}{5}$

7. Which of the following is the derivative of  $f(x) = \tan(\sin(x))$ ?

(a)  $\cos(\tan(x)) \sec^2(x)$

(b)  $\sec^2(\sin(x))(-\cos(x))$

(c)  $\sec^2(\sin(x)) + \tan(\cos(x))$

(d)  $\sec^2(\sin(x)) (\cos(x))$

(e)  $\sec^2(\cos(x))$

8. Given that the linear approximation to  $f$  at  $x = 2$  is  $L(x) = \frac{3}{2} + \frac{5}{2}x$ , what are  $f(2)$  and  $f'(2)$ ?

(a)  $f(2) = \frac{13}{2}, f'(2) = \frac{5}{2}$

(b)  $f(2) = 8, f'(2) = \frac{13}{2}$

(c)  $f(2) = \frac{3}{2}, f'(2) = \frac{5}{2}$

(d)  $f(2) = -\frac{7}{2}, f'(2) = -\frac{5}{2}$

(e)  $f(2) = \frac{3}{2}, f'(2) = -\frac{5}{2}$

9. Compute  $\lim_{x \rightarrow -\infty} \frac{2e^x - e^{-x}}{e^x + 2e^{-x}}$

- (a) 2
- (b) -2
- (c)  $\frac{1}{2}$
- (d) None of these
- (e)  $-\frac{1}{2}$

10. Find the slope of the line tangent to the curve  $x^3 + 3xy + y^3 = 15$  at the point  $(1, 2)$ .

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

11. Which of the following is the approximation to  $\sqrt{1.3}$  using the linear approximation to  $f(x) = \sqrt{x}$  at  $x = 1$ .

- (a) 1
- (b)  $\frac{11}{10}$
- (c)  $\frac{13}{10}$
- (d)  $\frac{23}{20}$
- (e)  $\frac{21}{20}$

12. Given  $f$  is a one-to-one function with  $f(2) = 4$ ,  $f(4) = 2$ ,  $f'(2) = -3$ , and  $f'(4) = -2$ . If  $g = f^{-1}$ , what is  $g'(4)$ ?

- (a)  $\frac{3}{16}$
- (b)  $-\frac{1}{8}$
- (c)  $-\frac{1}{2}$
- (d)  $\frac{1}{2}$
- (e)  $-\frac{1}{3}$

## 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.

13. (6 points each) Find the following derivatives (you do NOT have to simplify your answers):

(a) The first derivative of  $f(x) = \frac{1 + 5x}{\tan(\pi x)}$ .

(b) The second derivative of  $g(x) = e^{-x^2}$

(c) The first derivative of  $y = e^{-ax} \sin(bx)$ , where  $a$  and  $b$  are constants.

14. (8 points) The curves  $y = 2x^3$  and  $x^2 + 3y^2 = 13$  intersect at the point  $(1, 2)$ . Show the curves are orthogonal.

15. (12 points) Given the position function  $\mathbf{r}(t) = \langle 4 \sin(2t), 3 \cos(2t) \rangle$ , find the velocity, speed, and acceleration when  $t = \frac{\pi}{6}$ .

velocity: \_\_\_\_\_.

speed: \_\_\_\_\_.

acceleration: \_\_\_\_\_.

16. (10 points) Water is leaking out of an inverted conical tank at a rate of  $6000 \text{ cm}^3/\text{min}$ . The tank has height  $600 \text{ cm}$  and the diameter at the top is  $400 \text{ cm}$ . At what rate is the water level changing when the height of the water is  $200 \text{ cm}$ ?

(The volume of a cone is  $V = \frac{1}{3}\pi r^2 h$  )

17. (9 points) Find the equation of the line tangent to  $f(x) = \sqrt{4x + (2x - 3)^{10}}$  at the point where  $x = 2$ .

**DO NOT WRITE BELOW!**

Question	Points Awarded	Points
1-12		48
13		18
14		8
15		12
16		10
17		9
<b>TOTAL</b>		105