

**MATH 151, SPRING 2006
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 1-13), mark the correct choice on your ScanTron form No. 815-E using a No. 2 pencil. *For your own records, also record your choices on your exam!* ScanTrons will be collected from all examinees after 90 minutes and will not be returned.
3. In Part 2 (Problems 14-17), 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 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 |
|----------|----------------|--------|
| 1-12 | | 48 |
| 13 | | 9 |
| 14 | | 14 |
| 15 | | 9 |
| 16 | | 10 |
| 17 | | 10 |
| | | 100 |

PART I

1. (4 pts) If $g(x) = (x^3 + x)^5$, then $g'(-1) =$

- (a) 160
- (b) 80
- (c) 0
- (d) 320
- (e) 40

2. (4 pts) $4 \ln 2 + \ln \frac{3}{4} =$

- (a) $\ln 25$
- (b) $\ln 24$
- (c) $\ln 12$
- (d) $\ln 54$
- (e) $\ln 6$

Exam continues on next page

3. (4 pts) Find the slope of the tangent line to the curve $\sin(xy) = x^2 - 3$ at the point $\left(\sqrt{3}, \frac{\pi}{\sqrt{3}}\right)$.

- (a) $-2 - \frac{\pi}{3}$
- (b) $-2 - \frac{3}{\pi}$
- (c) $-2 + \frac{\pi}{3}$
- (d) $-2 + \frac{3}{2\pi}$
- (e) -2

4. (4 pts) If $f(x) = \frac{1}{x+2}$, then the inverse function of $f(x)$ is

- (a) $\frac{x}{1+2x}$
- (b) $\frac{1-2x}{x}$
- (c) $\frac{1+2x}{x}$
- (d) $-\frac{1}{(x+2)^2}$
- (e) $x+2$

Exam continues on next page

5. (4 pts) $\lim_{t \rightarrow 0} \frac{\sin^2(4t)}{2t^2} =$

- (a) 4
- (b) 0
- (c) 2
- (d) 1
- (e) 8

6. (4 pts) If $f(x) = x + \sin(x) + 2e^{3x}$ and $g(x) = f^{-1}(x)$, then $g'(2) =$

- (a) $\frac{1}{2}$
- (b) $\frac{1}{8}$
- (c) 1
- (d) $\frac{1}{7}$
- (e) $\frac{1}{3}$

Exam continues on next page

7. (4 pts) If $h(x) = \sin^2(3x)$, then $h''(x) =$

- (a) 18
- (b) $9 \sin^2(3x)$
- (c) $18(\cos^2(3x) - \sin^2(3x))$
- (d) $9(\cos^2(3x) - 1)$
- (e) $6 \cos(3x)$

8. (4 pts) Find the linear approximation of $f(x) = \frac{1}{x}$ at $a = 4$.

- (a) $\frac{1}{4} - \frac{x}{8}$
- (b) $\frac{1}{2} + \frac{x}{8}$
- (c) $\frac{1}{2} - \frac{x}{16}$
- (d) $\frac{1}{2} + \frac{x}{16}$
- (e) $1 + x$

Exam continues on next page

9. (4 pts) The length of leg \overline{AB} of right triangle ABC increases at a rate of 2 inches per second and the length of leg \overline{BC} increases at a rate of 6 inches per second. At what rate in inches per second does the hypotenuse increase when $\overline{AB} = 3$ and $\overline{BC} = 4$?

- (a) 4
- (b) 30
- (c) 26
- (d) $\frac{26}{5}$
- (e) 6

10. (4 pts) $\lim_{x \rightarrow -\infty} \frac{2 - e^{5x}}{1 + e^{2x}} =$

- (a) ∞
- (b) 2
- (c) 1
- (d) $-\infty$
- (e) -1

Exam continues on next page

11. (4 pts) A curve C is given by the parametric equations $x = 2t^3 - 3t^2$, $y = t^2 - t$. Find all horizontal and vertical tangents.

- (a) horizontal tangent at $t = 2$, vertical tangent at $t = -1$ and $t = 1$.
- (b) horizontal tangent at $t = -1$ and $t = 1$, vertical tangent at $t = 2$.
- (c) horizontal tangent at $t = \frac{1}{2}$, vertical tangent at $t = 0$ and $t = 1$.
- (d) horizontal tangent at $t = 0$ and $t = 1$, vertical tangent at $t = \frac{1}{2}$.
- (e) None of the above

12. (4 pts) Newton's method with the initial guess $x_1 = -1$ is used to find a zero of $f(x) = x^5 - x + 1$. What value does Newton's method give for x_2 ?

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

Exam continues on next page

PART II

13. (9 pts) If $(x^2 + xy)^3 = x^2 + y^2 - 6$, then find $\frac{dy}{dx}$ when $(x, y) = (1, -2)$.

Exam continues on next page

14. Find $g'(x)$ for the following functions. *Don't* simplify!

(a) (7 pts) $g(x) = \frac{\tan(3x)}{x^2 + \sec(x)}$

Exam continues on next page

(b) (7 pts) $g(x) = xe^{7x^5 - 8x^4}$

Exam continues on next page

15. Let $h(x) = f(x^4)$ where $f(-1) = 5$, $f(1) = 13$, $f'(-1) = 3$, $f'(1) = 2$, $f''(-1) = -4$ and $f''(1) = -2$.

(a) (6 pts) Compute $h'(-1)$.

(b) (3 pts) Compute $h''(-1)$.

Exam continues on next page

16. The position of a particle is given by the vector function $\mathbf{r}(t) = \langle t - 2 \sin t, 2 - 2 \cos t \rangle$.

(a) (2 pts) Find the position of the particle at time $t = \pi/2$.

(b) (3 pts) Find the velocity of the particle at time $t = \pi/2$.

(c) (2 pts) Find the speed of the particle at time $t = \pi/2$.

(d) (3 pts) Find the acceleration of the particle at time $t = \pi/2$.

Exam continues on next page

17. (10 pts) A paper cup has the shape of a cone with height 10 cm and radius 3 cm (at the top). If water is poured into the cup at a rate of $2 \text{ cm}^3/\text{sec}$, how fast is the water level rising when the water is 5 cm deep? The volume of a cone is $V = \frac{1}{3}\pi r^2 h$.

End of exam