

**MATH 151, SPRING 2006
COMMON EXAM I - VERSION B**

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 14-19), 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
1-13		52
14		10
15		6
16		6
17		10
18		6
19		10
		100

PART I

1. (4 pts) Find the slope of the line given by the parametric equations $x = 7 - 6t$, $y = 8 + 2t$.

- (a) $\frac{1}{3}$
- (b) 3
- (c) -12
- (d) $-\frac{1}{3}$
- (e) -3

2. (4 pts) If $g(x) = 2x^2 - 8\sqrt{x} + 4x$, then $g'(4) =$

- (a) 6
- (b) 32
- (c) 18
- (d) 16
- (e) 24

Exam continues on next page

3. (4 pts) Which statement about the function g defined by $g(x) = \frac{x^2 - 1}{(x + 1)(x + 5)}$ is true?

- (a) both $y = -1$ and $y = 1$ are horizontal asymptotes.
- (b) only $x = -5$ is a vertical asymptote.
- (c) only $y = -1$ is a horizontal asymptote.
- (d) both $x = 1$ and $x = -5$ are vertical asymptotes.
- (e) none of the above.

4. (4 pts) Let $h(x) = xf(x) - g(x)$ and suppose that $f(2) = 2$, $f'(2) = -1$, $g(2) = 3$, $g'(2) = 4$. Then $h'(2) =$

- (a) -4
- (b) -2
- (c) -10
- (d) -8
- (e) -5

Exam continues on next page

5. (4 pts) A particle moves according to a law of motion $s = \frac{t}{t^2 + 1}$, where the time t is measured in seconds and the displacement s in feet. What is the *instantaneous* velocity of the particle at time $t = \sqrt{2}$ seconds?

- (a) 3 ft/sec
- (b) -3 ft/sec
- (c) $\frac{1}{9}$ ft/sec
- (d) $-\frac{1}{9}$ ft/sec
- (e) $\frac{1}{2\sqrt{2}}$ ft/sec

6. (4 pts) If $\lim_{x \rightarrow a} g(x) = 4$ and $\lim_{x \rightarrow a} [f(x) + (g(x))^2] = 12$, then $\lim_{x \rightarrow a} f(x) =$

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

Exam continues on next page

7. (4 pts) $\lim_{x \rightarrow -4^-} \frac{|x+4|}{x^2-16} =$

(a) $-\frac{1}{8}$

(b) $\frac{1}{8}$

(c) $\frac{1}{4}$

(d) $-\frac{1}{4}$

(e) Does not exist.

8. (4 pts) The domain of the function f defined by $f(x) = \sqrt{x^2 - 6x + 5}$ is

(a) $(-\infty, 2] \cup [6, \infty)$

(b) $(-\infty, 1] \cup [5, \infty)$

(c) $[2, 6]$

(d) $(1, 5)$

(e) $[1, 5]$

Exam continues on next page

9. (4 pts) For what value of the constant c is the function f defined by

$$f(x) = \begin{cases} cx^2 - 1, & \text{if } x < -1 \\ 2c - x, & \text{if } x \geq -1, \end{cases}$$

continuous on $(-\infty, \infty)$?

- (a) 2
 - (b) -2
 - (c) 0
 - (d) 1
 - (e) -1
10. (4 pts) In which interval must the polynomial $f(x) = x^3 + 6x - 4$ have a root?
- (a) $2 < x < 3$
 - (b) $-1 < x < 0$
 - (c) $0 < x < 1$
 - (d) $1 < x < 2$
 - (e) There is no root.

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11. (4 pts) Find the angle between the vectors $\langle -1, \sqrt{3} \rangle$ and $\langle 1, \sqrt{3} \rangle$.

- (a) $\frac{\pi}{6}$
- (b) $\frac{\pi}{4}$
- (c) $\frac{\pi}{3}$
- (d) $\frac{2\pi}{3}$
- (e) $\frac{\pi}{2}$

12. (4 pts) $\lim_{x \rightarrow 5} \frac{x - 5}{x^2 - 8x + 15} =$

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

Exam continues on next page

13. (4 pts) A balloon is rising. Its height (in meters) at time t (in seconds) is given in the following table:

t	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
h	41	42	43	45	47	50	53	56	58	60	61

Estimate the velocity of the balloon at $t = 2.0$ seconds.

- (a) 47 m/sec
- (b) 30 m/sec
- (c) 22 m/sec
- (d) 18 m/sec
- (e) 60 m/sec

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PART II

14. (10 pts) Let $f(x) = \frac{1}{x^2}$. Use the definition of the derivative to compute $f'(2)$. (*No credit will be given for using any other method, correct answer notwithstanding.*)

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15. (6 pts) Suppose that $\mathbf{r}(t) = \langle t^3 - t + 3, 8t^2 \rangle$ and $\mathbf{r}'(t) = \langle 3t^2 - 1, 16t \rangle$. Find parametric equations for the tangent line to the curve at the point where $t = 2$.

16. (6 pts) Find the equation of the tangent line to the curve $y = \frac{3x - 2}{x^2 + 4}$ at the point where $x = 1$.

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17. (a) (4 pts) Find the vector projection of $\mathbf{b} = \langle 1, 2 \rangle$ onto $\mathbf{a} = \langle 1, 1 \rangle$.

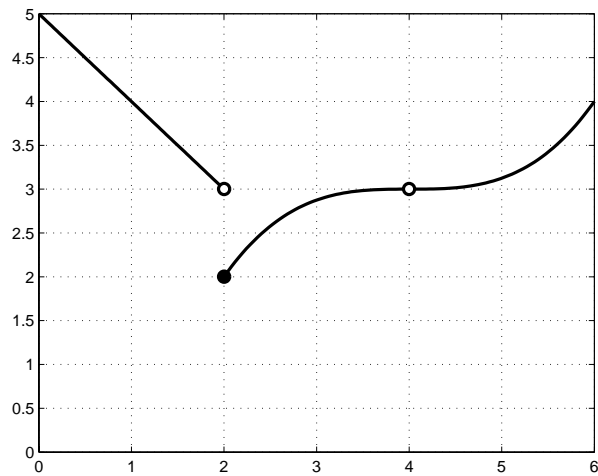
(b) (6 pts) Find the distance from the point $(1, 2)$ to the line $y = x$.

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18. (6 pts) Evaluate $\lim_{h \rightarrow 0} \frac{\sqrt{16 + 2h} - 4}{h}$.

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19. Here is the graph of a function $f(x)$.



(a) (2 pts) Find $\lim_{x \rightarrow 4} f(x)$.

(b) (2 pts) Is f continuous at $x = 4$? *Explain your answer!*

(c) (2 pts) Is f differentiable at $x = 2$? *Explain your answer!*

(d) (4 pts) Find both $\lim_{x \rightarrow 2^+} f(x)$ and $\lim_{x \rightarrow 2^-} f(x)$.

End of exam