MATH 151, SPRING 2006
COMMON EXAM I - VERSION A

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 angle between the vectors $\langle -1\,,\,\sqrt{3}\rangle$ and $\langle 1\,,\,\sqrt{3}\rangle$.

   (a) $\dfrac{\pi}{2}$

   (b) $\dfrac{\pi}{6}$

   (c) $\dfrac{\pi}{4}$

   (d) $\dfrac{\pi}{3}$

   (e) $\dfrac{2\pi}{3}$

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

   (a) 16

   (b) 18

   (c) 32

   (d) 24

   (e) 6

Exam continues on next page

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

(a) both $y = -1$ and $y = 1$ are horizontal asymptotes.

(b) only $y = -1$ is a horizontal asymptote.

(c) both $x = 1$ and $x = -5$ are vertical asymptotes.

(d) only $x = -5$ is a vertical asymptote.

(e) none of the above.

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

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

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

(a) 0

(b) 1

(c) -1

(d) 2

(e) -2

Exam continues on next page

5. (4 pts) Find the slope of the line given by the parametric equations $x = 7 - 6t$, $y = 8 + 2t$.

(a) $\frac{1}{3}$

(b) $-\frac{1}{3}$

(c) 3

(d) -3

(e) -12

6. (4 pts) In which interval must the polynomial $f(x) = x^3 + 6x - 4$ have a root?

(a) $-1 < x < 0$

(b) $0 < x < 1$

(c) $1 < x < 2$

(d) $2 < x < 3$

(e) There is no root.

Exam continues on next page

7. (4 pts) The domain of the function f defined by $f(x) = \sqrt{x^2 - 6x + 5}$ is

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

(b) $[1\,,\,5]$

(c) $(1\,,\,5)$

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

(e) $[2\,,\,6]$

8. (4 pts) $\lim_{x \to 5} \dfrac{x - 5}{x^2 - 8x + 15} =$

(a) $\dfrac{1}{2}$

(b) 2

(c) 1

(d) 0

(e) ∞

Exam continues on next page

9. (4 pts) A particle moves according to a law of motion $s = \dfrac{t}{t^2+1}$, 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) $\dfrac{1}{2\sqrt{2}}$ ft/sec

(b) -3 ft/sec

(c) 3 ft/sec

(d) $-\dfrac{1}{9}$ ft/sec

(e) $\dfrac{1}{9}$ ft/sec

10. (4 pts) If $\lim\limits_{x\to a} g(x) = 4$ and $\lim\limits_{x\to a}[f(x) + (g(x))^2] = 12$, then $\lim\limits_{x\to a} f(x) =$

(a) 4

(b) 2

(c) -2

(d) -8

(e) -4

Exam continues on next page

11. (4 pts) $\lim_{x \to -4^-} \dfrac{|x+4|}{x^2-16} =$

(a) $-\dfrac{1}{4}$

(b) $\dfrac{1}{4}$

(c) $-\dfrac{1}{8}$

(d) $\dfrac{1}{8}$

(e) Does not exist.

12. (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) -2

(b) -5

(c) -4

(d) -8

(e) -10

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

Exam continues on next page

PART II

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

Exam continues on next page

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 $y = \dfrac{3x - 2}{x^2 + 4}$ at the point where $x = 1$.

Exam continues on next page

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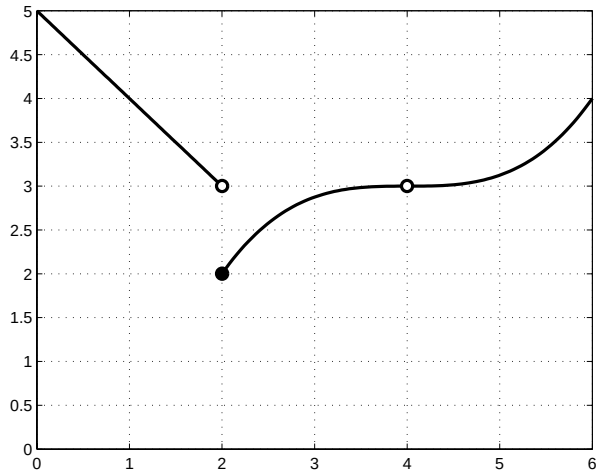
18. (6 pts) Evaluate $\lim_{h \to 0} \dfrac{\sqrt{16+2h}-4}{h}$.

Exam continues on next page

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



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

(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 $\lim_{x \to 2^+} f(x)$ and $\lim_{x \to 2^-} f(x)$.

End of exam