MATH 151, FALL 2009
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 1-11), 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 12-17), 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
1-11		44
12		15
13		10
14		10
15		5
16		6
17		10
		100

PART I: Multiple Choice

1. (4 pts) $\lim_{x \to 2} \dfrac{\sin(x-2)}{x^2+2x-8} =$

   (a) -1

   (b) $\dfrac{1}{6}$

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

   (d) $\dfrac{1}{5}$

   (e) The limit does not exist.

2. (4 pts) Find $f''(1)$ for $f(x) = e^{-x^2}$.

   (a) $\dfrac{4}{e}$

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

   (c) $\dfrac{1}{e}$

   (d) $\dfrac{2}{e}$

   (e) $-\dfrac{6}{e}$

3. (4 pts) Find the tangent vector of unit length for $\mathbf{r}(t) = \langle 4\cos t, 2\sin t \rangle$ at $t = \dfrac{\pi}{3}$.

   (a) $\left\langle \dfrac{2}{\sqrt{7}}, \sqrt{\dfrac{3}{7}} \right\rangle$

   (b) $\left\langle \dfrac{3}{\sqrt{7}}, -\sqrt{\dfrac{2}{7}} \right\rangle$

   (c) $\left\langle -\dfrac{2\sqrt{3}}{\sqrt{13}}, \dfrac{1}{\sqrt{13}} \right\rangle$

   (d) $\left\langle -\dfrac{2}{\sqrt{7}}, \sqrt{\dfrac{3}{7}} \right\rangle$

   (e) $\left\langle -\dfrac{1}{\sqrt{13}}, \dfrac{2\sqrt{3}}{\sqrt{13}}, \right\rangle$

4. (4 pts) If $h(x) = xf(x^3)$, $f(2) = 4$, $f(8) = 3$ and $f'(8) = -1$, find $h'(2)$.

(a) $h'(2) = -12$
(b) $h'(2) = -21$
(c) $h'(2) = 24$
(d) $h'(2) = -2$
(e) $h'(2) = 8$

5. (4 pts) Find $Q(x)$, the quadratic approximation, for $f(x) = \cos(2x)$ at $x = 0$.

(a) $Q(x) = x^2$
(b) $Q(x) = 1 + x - 2x^2$
(c) $Q(x) = 1$
(d) $Q(x) = 1 - 2x^2$
(e) $Q(x) = 1 + x + 2x^2$

6. (4 pts) $\lim_{x \to -3^-} e^{\frac{1}{x+3}} =$

(a) 1
(b) $-\infty$
(c) ∞
(d) 0
(e) e

7. (4 pts) Given the curve parameterized by $x = t^2 + 5$, $y = \sqrt{t}$, what is the slope of the tangent line at the point $(21, 2)$?

(a) $m = 82\sqrt{21}$

(b) $m = \dfrac{1}{32}$

(c) $m = \dfrac{1}{82\sqrt{21}}$

(d) $m = \dfrac{1}{2}$

(e) $m = 32$

8. (4 pts) An object is moving according to the equation of motion $s(t) = \cos t + \dfrac{1}{4}t^2$. Find the time(s) when the acceleration is zero for $0 \leq t \leq 2\pi$.

(a) $t = \dfrac{\pi}{3}$ and $t = \dfrac{2\pi}{3}$

(b) $t = \dfrac{\pi}{3}$ and $t = \dfrac{5\pi}{3}$

(c) $t = \dfrac{\pi}{6}$ and $t = \dfrac{5\pi}{6}$

(d) $t = \dfrac{\pi}{6}$ and $t = \dfrac{11\pi}{6}$

(e) $t = \dfrac{2\pi}{3}$ and $t = \dfrac{4\pi}{3}$

9. (4 pts) What is the slope of the tangent line to the curve $x^3 + y^3 = 6xy$ at the point $(3, 3)$?

(a) $-\dfrac{9}{7}$

(b) 1

(c) $\dfrac{9}{7}$

(d) 5

(e) -1

10. (4 pts) A particle moves according to the equation of motion $s(t) = t^2 - 2t + 3$ where $s(t)$ is measured in feet and t is measured in seconds. Find the total distance traveled in the first 3 seconds.

    (a) 2 feet

    (b) 4 feet

    (c) 9 feet

    (d) 11 feet

    (e) 5 feet

11. (4 pts) Find all point(s) on the curve $x = t^2 - 2t + 4$, $y = t^3 - 3t^2$ where the tangent line is vertical.

    (a) $(4, 0)$ and $(4, -4)$

    (b) $(3, -2)$

    (c) $(1, 0)$

    (d) $(0, 0)$ and $(2, 2)$

    (e) $(4, 4)$

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. (15 points total) Find the derivative of:

(i) (5 pts) $f(x) = x\cos^4(x^3)$

(ii) (5 pts) $g(t) = \sqrt[3]{6t - t^2}$

(iii) (5 pts) $h(x) = e^{\sec\sqrt{x}}$

13. (10 pts) The altitude of a triangle is decreasing at a rate of $\frac{1}{2}$ cm per minute while the area is increasing at a rate of 2 cm^2/min. How fast is the base of the triangle changing when the altitude is 6 cm and the area is 30 cm^2?

14. (10 pts) Find $\frac{dy}{dx}$ for $\sin(5y + 7x) = 4x^2 + y^3$.

15. (5 pts) If $f(x) = e^{3x} + 6x + 1$, find $g'(2)$ where $g = f^{-1}$, the inverse of f.

16. (6 pts) Given that $f(x) = \dfrac{3x+1}{5-x}$, find $f^{-1}(x)$

Exam continues on next page

17. (a) (5 pts) Find the linear approximation for $f(x) = \sqrt{x}$ at $x = 4$.

(b) (5 pts) Approximate $\sqrt{4.1}$.