MATH 151, FALL 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 1-11), mark the correct choice on your ScanTron using a No. 2 pencil. The scantrons will not be returned, therefore *for your own records, also record your choices on your exam!*
3. In Part 2 (Problems 12-16), 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		12
13		10
14		10
15		12
16		12
		100

PART I: Multiple Choice

1. (4 pts) An object is moving according to the equation $s(t) = t^3 - 9t^2 + 15t + 8$. When is the object moving in the negative direction?

   (a) $0 < t < 1$ and $t > 5$

   (b) $0 < t < 2$ and $t > 3$

   (c) $0 < t < 5$

   (d) $1 < t < 5$

   (e) $1 < t < 6$

2. (4 pts) Find the slope of the tangent line to the parametric curve $x = e^{-5t}$, $y = t\cos t$ at the point $(1, 0)$.

   (a) $m = -1$

   (b) $m = -5$

   (c) $m = 5$

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

   (e) $m = -\dfrac{1}{5}$

3. (4 pts) Find the linear approximation, $L(x)$, of $f(x) = \sqrt{x^2 + 9}$ at $x = -4$.

   (a) $L(x) = -\dfrac{4}{5}x + \dfrac{9}{5}$

   (b) $L(x) = \dfrac{1}{5}x + \dfrac{29}{5}$

   (c) $L(x) = -\dfrac{4}{5}x + \dfrac{41}{5}$

   (d) $L(x) = \dfrac{1}{5}x + \dfrac{4}{5}$

   (e) $L(x) = -\dfrac{4}{5}x - \dfrac{16}{5}$

4. (4 pts) $\lim\limits_{t\to 0} \dfrac{t^3}{\sin^3(2t)} =$

   (a) 8

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

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

   (d) 2

   (e) 0

5. (4 pts) Find a unit tangent vector to the curve $\mathbf{r}(t) = \left\langle \frac{2}{t} + 1, t\sqrt{t} + \frac{t}{2} \right\rangle$ at $t = 1$.

(a) $\left\langle -\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}} \right\rangle$

(b) $\left\langle -\frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$

(c) $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$

(d) $\left\langle -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$

(e) $\left\langle \frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}} \right\rangle$

6. (4 pts) If $g(x) = f(x^3) + (f(x))^3$, $f(1) = 2$ and $f'(1) = -3$, find $g'(1)$.

(a) $g'(1) = -39$

(b) $g'(1) = 27$

(c) $g'(1) = 3$

(d) $g'(1) = -33$

(e) $g'(1) = -45$

7. (4 pts) Find the slope of the tangent line to the curve $y^3 - xy = 2x + 4$ at the point $(1, 2)$.

(a) $\frac{2}{11}$

(b) $\frac{4}{11}$

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

(d) 8

(e) $\frac{5}{3}$

8. (4 pts) If $g(x)$ is the inverse of $f(x) = \sqrt{x^3 + x + 6}$, find $g'(4)$.

(a) 8

(b) $\frac{13}{4}$

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

(d) $\frac{8}{13}$

(e) $\frac{13}{8}$

9. (4 pts) Find $f'\left(\frac{\pi}{4}\right)$ for $f(x) = x \sin x \cos x$.

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

(b) $\frac{1}{2} + \frac{\pi}{4}$

(c) $\frac{1}{2} + \frac{\sqrt{2}\pi}{4}$

(d) $\frac{1}{2} - \frac{\sqrt{2}\pi}{8}$

(e) $\frac{1}{2} + \frac{\sqrt{2}\pi}{8}$

10. (4 pts) $\lim_{x \to 4^-} \left(\frac{1}{3}\right)^{\frac{x}{x-4}} =$

(a) 1

(b) 0

(c) -1

(d) $-\infty$

(e) ∞

11. (4 pts) The graph of the curve $y = x + \frac{1}{3}\cos(3x)$ has a horizontal tangent at $x =$

(a) $\frac{\pi}{4}$

(b) $\frac{\pi}{3}$

(c) $\frac{\pi}{2}$

(d) $\frac{\pi}{6}$

(e) $\frac{\pi}{12}$

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. Given that $s(t) = e^{-3t}\cos(2t)$ is the equation of motion of an object, find

(i) (6 pts) The velocity at time t.

(ii) (6 pts) The acceleration at time t.

13. (10 pts) Find the equation of the tangent line to the curve $y = \sqrt{x + \sqrt{8 + x}}$ at $x = 1$.

14. (10 pts) Use differentials (or a linear approximation) to estimate $(1.02)^{10}$.

15. (12 pts) The volume of a cube is increasing at a rate of 10 cubic centimeters per minute. How fast is the surface area increasing when the edge length is 30 cm? Note: The volume of a cube is $V = x^3$ and the surface area of a cube is $A = 6x^2$.

16. Find $f'(t)$ for the following functions.

(i) (6 pts) $f(t) = \tan^3(t^2 + a^2)$

(ii) (6 pts) $f(t) = e^{t+\sqrt{t}}$