MATH 151, FALL 2008
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 1-10), 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 11-16), 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
1-10		40
11		12
12		10
13		10
14		8
15		12
16		8
		100

PART I: Multiple Choice

1. (4 pts) Find the inverse function of $f(x) = \dfrac{1-x}{4x+3}$

   (a) $f^{-1}(x) = \dfrac{4x+3}{1-x}$

   (b) $f^{-1}(x) = \dfrac{3x-1}{4x+1}$

   (c) $f^{-1}(x) = \dfrac{1-3x}{4x+1}$

   (d) $f^{-1}(x) = \dfrac{3x-1}{4x}$

   (e) $f^{-1}(x) = \dfrac{1-3x}{4x}$

2. (4 pts) Evaluate $\lim\limits_{x \to 0^-} e^{1/x}$

   (a) e

   (b) 1

   (c) $-\infty$

   (d) ∞

   (e) 0

3. (4 pts) If $Q(x)$ is the quadratic approximation for $f(x) = \dfrac{2}{x}$ at $x = 1$, then $Q\left(\dfrac{1}{2}\right) =$

(a) 3

(b) $\dfrac{7}{2}$

(c) $\dfrac{9}{2}$

(d) $\dfrac{5}{2}$

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

4. (4 pts) An object is moving with position function $f(t) = 2\sin t - 3\cos t$. Find the velocity, $v(t)$, and the acceleration, $a(t)$, at $t = \dfrac{\pi}{6}$.

(a) $v\left(\dfrac{\pi}{6}\right) = \sqrt{3} - \dfrac{3}{2}$ $\qquad$ $a\left(\dfrac{\pi}{6}\right) = 1 - \dfrac{3\sqrt{3}}{2}$

(b) $v\left(\dfrac{\pi}{6}\right) = \sqrt{3} - \dfrac{\sqrt{3}}{2}$ $\qquad$ $a\left(\dfrac{\pi}{6}\right) = 1 - \dfrac{3\sqrt{3}}{2}$

(c) $v\left(\dfrac{\pi}{6}\right) = -\sqrt{3} - \dfrac{3}{2}$ $\qquad$ $a\left(\dfrac{\pi}{6}\right) = -1 + \dfrac{3}{2}$

(d) $v\left(\dfrac{\pi}{6}\right) = \sqrt{3} + \dfrac{3}{2}$ $\qquad$ $a\left(\dfrac{\pi}{6}\right) = -1 + \dfrac{3\sqrt{3}}{2}$

(e) $v\left(\dfrac{\pi}{6}\right) = 1 + \dfrac{3\sqrt{3}}{2}$ $\qquad$ $a\left(\dfrac{\pi}{6}\right) = -\sqrt{3} + \dfrac{3}{2}$

5. (4 pts) In order to solve the equation $x^5 - 2x + 5 = 0$, we apply Newton's Method with an initial guess $x_1 = 1$. What value does Newton's Method give for x_2, the second approximation?

   (a) $\frac{1}{4}$
   (b) $\frac{7}{4}$
   (c) $-\frac{1}{4}$
   (d) $\frac{7}{3}$
   (e) $-\frac{1}{3}$

6. (4 pts) If g is the inverse of f, find $g'(2)$ if it is known that $f(3) = 2$, $f'(3) = 7$, $f(2) = 11$ and $f'(11) = 8$. Assume g to be differentiable.

   (a) $\frac{1}{8}$
   (b) $\frac{1}{2}$
   (c) $\frac{1}{7}$
   (d) $\frac{1}{11}$
   (e) $\frac{1}{5}$

7. (4 pts) Solve the equation $\ln(x+e) + \ln(x-e) = 2 + \ln 3$.

(a) $x = 2e$ only

(b) $x = 2e$ and $x = -2e$

(c) $x = 3e$ only

(d) $x = 1$ and $x = 3e$

(e) No solution

8. (4 pts) Find the tangent vector of unit length for $\mathbf{r}(t) = \langle e^{2t}, t\cos t \rangle$ at $t = 0$.

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

(b) $\langle 1, 1 \rangle$

(c) $\langle 1, 0 \rangle$

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

(e) $\langle 2, 1 \rangle$

9. (4 pts) If $h(x) = f \circ g = f(g(x))$, find $h'(-3)$ given that $g'(-3) = 4$, $f'(-3) = 7$, $g(-3) = -2$, $f'(-2) = 11$, and $f'(4) = -3$

   (a) -6
   (b) -14
   (c) 44
   (d) -3
   (e) 28

10. (4 pts) $\lim_{\theta \to 0} \dfrac{\sin^2(3\theta)}{\theta^2} =$

   (a) $\dfrac{1}{3}$
   (b) 9
   (c) $\dfrac{1}{9}$
   (d) 3
   (e) The limit does not exist

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.

11. Find the derivative of:

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

(ii) (6 pts) $g(t) = \sqrt{1 + \sqrt{t}}$.

12. (10 pts) Water is poured into a conical cup at the rate of $\frac{5}{2}$ cubic inches per second. If the cup is 6 inches tall and the top of the cup has a radius of 2 inches, how fast does the water level rise when the water is 2 inches deep? Be sure to include units with your answer. NOTE: The volume of a cone is $V = \frac{1}{3}\pi r^2 h$.

13. (10 pts) Find the equation of the tangent line to the curve $y^2 \sin 2x = 8 - 2y$ at the point $\left(\frac{\pi}{4}, 2\right)$.

14. Consider the curve given by parametric equations $x = t^3 - 6t^2$, $y = t^2 - 6t$

(i) (6 pts) Find the equation of the tangent line at $t = 1$.

(ii) (6 pts) Find all points on the curve where the tangent line is:

(a) vertical

(b) horizontal

Exam continues on next page

15. (8 pts) Use differentials or a linear approximation to approximate $\sqrt{9.02}$.

16. (8 pts) Find all value(s) of x, $0 \leq x \leq 2\pi$, where $f(x) = x + 2\sin x$ has a horizontal tangent.

End of Exam