MATH 151, FALL 2009
COMMON EXAM III - VERSION A

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 1-12), 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 13-17), 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
1-12		48
13		11
14		11
15		10
16		10
17		10
		100

PART I: Multiple Choice

1. (4 pts) $\lim_{x\to 0} \dfrac{x - \arcsin(2x)}{x + \arctan x} =$

   (a) 0

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

   (c) $-\dfrac{1}{2}$

   (d) $-\dfrac{3}{2}$

   (e) ∞

2. (4 pts) Find all critical numbers for $f(x) = x \ln x + 2x$.

   (a) $x = \dfrac{1}{e^3}$

   (b) $x = 0$

   (c) $x = e$

   (d) $x = 0$ and $x = e$

   (e) $x = \dfrac{1}{e^3}$ and $x = 0$.

3. (4 pts) Find $f(\pi)$ if $f'(x) = 3\cos x - 5\sin x$ and $f(0) = 6$.

   (a) $f(\pi) = -6$

   (b) $f(\pi) = -5$

   (c) $f(\pi) = -4$

   (d) $f(\pi) = -3$

   (e) $f(\pi) = -2$

4. (4 pts) $\arctan\left(\tan\dfrac{2\pi}{3}\right) =$

(a) $\dfrac{4\pi}{3}$

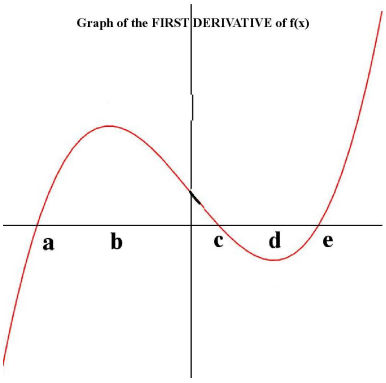
(b) $\dfrac{2\pi}{3}$

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

(d) $\dfrac{5\pi}{3}$

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

5. (4 pts) Given the graph of the derivative, $f'(x)$, of a function $f(x)$ below, where is the graph of $f(x)$ concave down?



(a) $(0, \infty)$

(b) $(-\infty, b) \cup (d, \infty)$

(c) $(-\infty, a) \cup (c, e)$

(d) $(-\infty, 0)$

(e) (b, d)

6. (4 pts) Find $\dfrac{dy}{dx}$ for $y = x^{\sin x}$.

(a) $\dfrac{dy}{dx} = \cos x(\ln x)x^{\sin x}$

(b) $\dfrac{dy}{dx} = \cos x \ln x + \dfrac{\sin x}{x}$

(c) $\dfrac{dy}{dx} = x^{\sin x}\left(\cos x \ln x + \dfrac{\sin x}{x}\right)$

(d) $\dfrac{dy}{dx} = x^{\sin x}\left(-\cos x \ln x + \dfrac{\sin x}{x}\right)$

(e) $\dfrac{dy}{dx} = (\sin x)x^{\sin x - 1}$

7. (4 pts) If $\sum_{i=1}^{4} a_i = 1$ and $\sum_{i=1}^{4} b_i = -2$, find $\sum_{i=1}^{4} (a_i + 2b_i + 2)$

(a) -3
(b) -1
(c) 5
(d) -6
(e) 6

8. (4 pts) Find the absolute maximum for $f(x) = x^3 - 12x + 1$ on the interval $[1, 3]$.

(a) -15
(b) 0
(c) -8
(d) -10
(e) 17

9. (4 pts) If $f(x) = 2\ln(\arctan x)$, then $f'(1) =$

(a) $\ln \frac{1}{2}$
(b) $\frac{4}{\pi}$
(c) $\frac{1}{8\pi}$
(d) $\ln \frac{4}{\pi}$
(e) $\frac{2}{\pi}$

10. (4 pts) Where is $f(x) = xe^{3x}$ decreasing?

(a) nowhere

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

(c) $(-\infty, -\frac{1}{3})$

(d) $(-3, \infty)$

(e) $(-\infty, -3)$

11. (4 pts) Find the x-coordinate for the inflection point(s) for $f(x) = x^4 - 6x^2$.

(a) $x = 0$ and $x = \pm\sqrt{3}$

(b) $x = 1$

(c) $x = \pm 1$

(d) $x = \pm\sqrt{3}$

(e) $x = -1$

12. (4 pts) $\cos(\arctan x) =$

(a) $\dfrac{1}{\sqrt{1+x^2}}$

(b) $\dfrac{x}{\sqrt{1-x^2}}$

(c) $\dfrac{\sqrt{1-x^2}}{x}$

(d) $\dfrac{1}{1+x^2}$

(e) $\dfrac{x}{\sqrt{1+x^2}}$

PART II WORK OUT

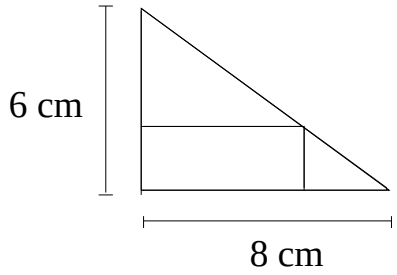
Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

13. (11 pts) Solve for x: $\log_4(x^2 - 16) - \log_4(1 - 2x) = 1$

14. (11 pts) Find $\lim_{x \to 0} (e^{2x} + x)^{1/x}$.

15. (10 pts) Newton's Law of Cooling states the rate of cooling of an object is proportional to the temperature difference between the object and the temperature of the object's surroundings. A pie is taken from an oven where its temperature has reached 375° F and is placed on a table in a room where the temperature is 75° F. If the temperature of the pie is 200° F after 20 minutes, find a formula for the temperature of the pie at time t, where t is measured in minutes.

16. (10 pts) Find the area of the largest rectangle that can be inscribed in a right triangle with legs of length 6 cm and 8 cm if two sides of the rectangle lie along the legs.



17. (10 pts) Approximate the area under the graph of $f(x) = x^2 + 2$, above the x axis, from $x = -1$ to $x = 7$ using 4 subintervals of equal width and right endpoints. Simplify your answer.