Name (Last, First) _____ **ID #** _____

Signature _____

Lecturer _____ **Section #** _____

UNIVERSITY OF MASSACHUSETTS AMHERST
DEPARTMENT OF MATHEMATICS AND STATISTICS

Math 131 **Exam 2** **November 1, 2006**
7:00-8:30 p.m.

- **Turn off all cell phones and watch alarms!** Put away iPods, etc.
- When calculating derivatives in #1–7, do ***not*** "simplify" your answers. But *do* use enough parentheses to show clearly how expressions are grouped together. For example, do *not* write $x + 2 \cdot x - 1$ if you really mean $(x + 2)(x - 1)$.
- Do ***not*** use a calculator; do ***not*** use any "cheat sheet" or other paper.
- Organize your work in an unambiguous order. Show all necessary steps.
- Do all work in this exam booklet. You may continue work to backs of pages and the blank page at the end, but if you do so indicate where.
- Be ready to show your UMass ID card when you hand in your exam booklet.

QUESTION	PER CENT	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
TOTAL	100	

1. (10%) Calculate:

$$\frac{d}{dx}\left(x^{10} - 10^{10} + 10^{x}\right) \; =$$

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2. (10%) Calculate:

$$\frac{d}{dx}\,\ln(x^3 - 1) \; =$$

3. (10%) Calculate:

$$\frac{d}{dx}\left(e^{-x}\,\sin^2 x\right) \;=$$

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4. (10%) Calculate:

$$\frac{d}{dx}\left(\frac{\sqrt[3]{x^2+1}}{5x+3}\right) \;=$$

5. (10%) Calculate:

$$\frac{d}{dx}\left(\sqrt{1+x^2}\,\arctan x\right) =$$

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6. (10%) Calculate:

$$\frac{d}{dx}\left[\sec\left(e^{5-4x^2}\right)\right] =$$

7. (10%) Calculate:

$$\frac{d}{dx}\, e^{x\,\ln(\tan x)} \;=$$

8. (10%) An object is moving along the x-axis. Its coordinate $x(t)$, in feet, at time t, in seconds, is

$$x(t) = 80\,t - 16\,t^2 + 5\,t^3.$$

What is the object's ***acceleration*** at time $t = 2$?

9. (10%) Find an equation for the tangent line to the graph of

$$2\,x^3 + 2\,y^3 = 9\,x\,y$$

at the point $(x, y) = (1, 2)$.

10. (a) (2%) Recalling that arccos means $\cos^{-1}$, that is, "inverse of the cosine function," simplify:

$$\cos(\arccos x) =$$

(b) (8%) Use the identity you obtained in (a) to derive the formula:

$$\frac{d}{dx}(\arccos x) = -\frac{1}{\sqrt{1-x^2}}$$

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