Math 2425 Lab 1 Fall 2009

<u>Study Technique 1:</u> After each lecture, read/skim through your lecture notes and then work on the assigned homework. Try to keep up with homework and use the Math Clinic or GTA or instructor for any questions on which you are stuck. A study technique that is very effective when working through the homework is the following. Do the first two questions assigned; then redo them both, and do the third; then redo those three, and do the fourth; then redo those four and do the fifth, etc. This study technique allows different, but related, ideas that arise in different questions to connect, and so allows students to see the big picture of what is going on while, simultaneously, learning intricate details.

These problems are taken from the final exam given in Calculus I in spring 2008. These are problems a Calculus II student is expected to know how to solve. The square brackets following a question number refer to a section/problem number in your text.

1. [3.5, 3.7/~39] Find $f'(x)$ if $f(x) = \ln\left(\sqrt{\dfrac{x^2+1}{x^2+3}}\right)$.

   A. $\dfrac{2x}{(x^2+1)(x^2+3)}$ B. $\sqrt{\dfrac{x^2+3}{x^2+1}}$ C. $2x\sqrt{\dfrac{x^2+3}{x^2+1}}$
   D. $\dfrac{2x}{\sqrt{(x^2+1)(x^2+3)}}$ E. $2x\sqrt{\dfrac{x^2+1}{x^2+3}}$

2. [3.6/36] If r is a function of θ and $\cos r + \tan\theta = e^{2r\theta}$, find $\dfrac{dr}{d\theta}$.

   A. $\dfrac{\sec^2\theta - 2re^{2r\theta}}{2\theta e^{2r\theta}}$ B. $\dfrac{\sec^2\theta}{\sin r + 2\theta e^{2r\theta}}$ C. $\dfrac{\sec^2\theta - 2re^{2r\theta}}{\sin r}$
   D. $\dfrac{\sec^2\theta - 2re^{2r\theta}}{\sin r + 2\theta e^{2r\theta}}$ E. $\dfrac{-2re^{2r\theta}}{\sin r + 2\theta e^{2r\theta}}$

3. [3.9/11] The length x of a rectangle is **decreasing** at the rate of 2 cm/sec while the width y is **increasing** at the rate of 2 cm/sec. When $x = 12$ cm and $y = 5$ cm, find the rate of change of the area of the rectangle.

   A. $-14\,\text{cm}^2$/sec B. 14 cm^2/sec C. 34 cm^2/sec
   D. $-34\,\text{cm}^2$/sec E. $-4\,\text{cm}^2$/sec

4. [4.4/Example 8] For the graph of $f(x) = e^{2/x}$, find the x-coordinate of the inflection point.

   A. there is no inflection point B. e^{-2} C. e^2 D. 1
   E. -1

5. [4.5] A rectangular box with square base and no top is to have volume of exactly 4000 cm^3. What is the minimum possible <u>surface area</u> of such a box?

A. 20 cm^2 B. 20 cm^3 C. 1200 cm^2 D. 1200 cm^3
E. 200 cm^2

6. [4.6/47] Find the limit: $\lim_{x\to 1^+} x^{1/(1-x)}$.

A. 1 B. $\frac{1}{e}$ C. $\frac{1}{e^2}$ D. e E. does not exist

7. [4.8/~33] Evaluate $\int 2t^{-1/3}(t-1)\,dt$.

A. $\frac{6}{5}t^{5/3}-3t^{2/3}+C$ B. $\frac{4(t-1)^2}{3t^{4/3}}+C$ C. $6t^{2/3}+C$

D. $\frac{6}{5}t^{5/3}+3t^{2/3}+C$ E. $\frac{2}{3}t^{-5/3}+\frac{4}{3}t^{-1/3}+C$

8. [4.8/~59] Evaluate $\int \frac{1+\sin 3x}{2}\,dx$.

A. $\frac{x+\cos 3x}{2}+C$ B. $\frac{3}{2}\cos 3x+C$ C. $\frac{1}{2}x+\frac{1}{3\sqrt{1-9x^2}}+C$

D. $\frac{x-\cos 3x}{2}+C$ E. $\frac{3x-\cos 3x}{6}+C$

9. [5.4/40] Find $\frac{dy}{dx}$ given $y=\int_{2\sqrt{x}}^{2\sqrt{2}} \sin\left(t^4\right)dt$ for $x>2$.

A. $\frac{\sin\left(16x^2\right)}{\sqrt{x}}$ B. $\frac{-\sin\left(16x^2\right)}{\sqrt{x}}$ C. $-\sin\left(16x^4\right)$

D. $-\sin\left(16x^2\right)$ E. $\frac{-\sin\left(16x^4\right)}{\sqrt{x}}$

10. [5.5/43] Evaluate $\int \frac{dx}{x\ln x}$.

A. $\frac{x}{\ln x}+C$ B. $\ln\frac{1}{x}+C$ C. $\ln(\ln x)+C$

D. $\frac{x}{\ln|x|}+C$ E. $\ln|\ln x|+C$

11. [5.6/4a] Evaluate $\int_0^{\pi} 3\cos^2 x\sin x\,dx$.

A. -2 B. $\frac{\pi}{2}$ C. $\frac{\sqrt{2}}{2}$ D. 3 E. 2