Math 1431 DAY 36  
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If you e-mail me, please mention your course (1431) in the subject line.

OFFICE HOURS: MWF 11-11:30am, MW 1-2:15pm at 621 PGH.

BUBBLE IN PS ID VERY CAREFULLY! If you make a bubbling mistake, your scantron will not be saved in the system and you will not get credit for it even if you turned it in. Bubble in Popper Number.

**Be considerate of others in class. Respect your friends and do not distract anyone during the lecture.**

**Review for Test 4**

Number of Questions:  MC: 8 (8x6=48pts) FR: 4 +one bonus!

On the last question (problem12 / 13) (optimization), there are two options. Choose one of the problems; if you solve both, only the first one will be graded.

Time: 50 minutes

Topics covered: Chapters 4 and 5.

Reserve a seat for Test 4.

Take Practice Test 4.

Review sheet is posted on my website.

Go over the class notes, solve the review problems, practice test, past quizzes and EMCFs.

**If you miss the test, you will get a 0 on this test. Final replaces one missed test OR the lowest test grade (if it is better).**

We will solve some of these problems in class as time permits; the remaining problems will be solved in the after class notes.
1. If $f(x) = x^5 + 4x^3 + 2$, find $[f^{-1}]'(7)$.

2. If $f$ is invertible and $f(1) = 3, f(3) = 5, f(5) = 1, f'(1) = 4, f'(3) = 7, f'(5) = -2$

   $[f^{-1}]'(5) = ?$

3. Are the following functions invertible? Justify your answer.

   $f(x) = x^2 - 2x$

   $f(x) = 6x + \sin(2x)$

   $f(x) = x^3 + 2x$
4. Find the derivatives:

\[ y = e^{2x^3 + 4x} \]

\[ y = xe^{\tan x} \]

\[ y = 4^{5x^2 + 1} \]

\[ y = 4\ln(x^3 + \sqrt{x}) \]

\[ y = \log_5(x^2 + \sin(9x)) \]

\[ y = \ln(\sqrt{x^4 + \cos(2x)}) \]
5. Find the slope of the tangent line to the curve \( f(x) = 4xe^{2x} \) at \( x=0 \).

Exercise: Give the intervals where \( f(x) \) is increasing.
6. Find the derivatives:

   a. \( y = \cosh(2x^3) + \sinh(5x); \quad y'(0) = ? \)

   b. \( y = \arcsin(x^3 + 1) \)

   c. \( f(x) = 4\arctan(6x) \)
7. Find the derivative using logarithmic differentiation.

\[ y = (4x + 2)^{\sin x} \]
8. Use differentials to approximate $\sqrt{23}$.

9. Evaluate the following limits if they do exist.
   a. $\lim_{x \to 0} \frac{x - e^x + 1}{2x^2}$
b. \[ \lim_{{x \to 0}} \frac{e^{2x} - 2\sin x - 1}{e^x - x - 1} \]

c. \[ \lim_{{x \to 1^+}} \left( \frac{1}{\ln(x)} - \frac{1}{x - 1} \right) \]
d. \[
\lim_{x \to 0} 10x \sin \left( \frac{4}{x} \right)
\]
Optimization Problems:

Two options; chose one of the problems!!! If you solve both, only the first one will be graded.

10. Maximize the volume of a box –open on top – which has a square base and composed of 600 square inches of material.
11. A rectangle is drawn such that the upper corners are on the curve $y = \sqrt{16 - x^2}$ and the lower corners are on the x-axis. What is the largest possible area?
12. A rectangle is drawn in such a way that its base is on the x-axis, its left side is on the y-axis and its top right corner is on the line $y=-\frac{3}{4} x + 6$. What are the dimensions of the rectangle with the largest possible area? What is the maximum area?
13. 4 congruent squares will be cut from the corners of a paper that measures 24x45 ft to make an open top box. How much should be cut from the corners to maximize the volume of the box?