Math 140, Jeffrey Adams  
Test II, March 10, 2010

IMPORTANT INSTRUCTIONS
1. Write your name, section number, and TA’s name on each answer sheet.
2. Number the sheets 1-4. Do all of the work for problem 1 on sheet 1.
You may use the back if necessary – write “see back of sheet”. Similarly for
problems 2-4. Each problem is worth 25 points.
3. For full credit you must show your work.
4. No calculators.

Question 1.
(a) Use the limit definition of the derivative to compute $f'(x)$ where $f(x) = x^2 + 2$.
(b) Use the limit definition of the derivative to compute $f'(1)$ where $f(x) = 2|x| + 1$.
(c) Consider the function $f(x) = |x^2 - 1|$. For what values of $x$ is $f(x)$
differentiable at $x$? Justify your answer.

Question 2. Calculate the following derivatives. It is not necessary to simplify
your answers.
(a) $\frac{d}{dx} \sin(x^2 + x)$
(b) $\frac{d}{dx} \ln(\cos(x^2))$
(c) $\frac{d}{dx} \left( \frac{x^2 + 4}{x^2 + 1} \right)$
(d) $\frac{d^2}{dx^2} (xe^x)$

Question 3.
(a) Find the slope of the tangent line to the curve $x \cos(y) + y = \pi$ at $(0, \pi)$.
(b) Suppose a 5 foot ladder is leaning against a wall, and the base of the
ladder is moving away from the wall at 8 feet per second. How fast is the
top of the ladder moving down the wall when the top of the ladder is 4 feet
from the ground?

Question 4.
(a) Use the Newton-Raphson method to find an approximate solution to
$x^3 + x^2 + 1 = 0$. Starting with $c_1 = 1$, compute $c_2$ (simplify $c_2$) and $c_3$ (do
not simplify $c_3$).
(b) Use linear approximation to approximate the value of $\sqrt{17}$.

TAs: Chatchawan (Jack) Panraksa, Christian Sykes, Damon Gulczynski