PRACTICE SECOND IN-CLASS EXAM
CLOSED BOOK! SHOW ALL WORK!

“Pencil & Paper” Part

Instructions: The problems on this page are to be solved “with pencil and paper” (in other words, no calculators). Each problem is worth 5 points. In each problem, calculate $y'$. For full credit, leave the answer in simplest form.

1. $y = x \sin x$  
1. ______________________

2. $y = x^2 \sec x$  
2. ______________________

3. $y = \frac{1 + x^2}{1 - x}$  
3. ______________________

4. $y = \cot(x^2)$  
4. ______________________
Math 165 Practice Second In-Class Exam
“Work-out” Part

Instructions: Work any four of these six problems. Each is worth 20 points. Show steps for any required calculations and state reasons to justify any conclusions. Answers without any explanation will receive no credit.

1. Use implicit differentiation to find $dy/dx$ if $y$ is given by the equation

$$x\sqrt{1+y} + y\sqrt{1+2x} = 2x.$$ 

2. The limit

$$\lim_{h \to 0} \frac{(2 + h)^3 - 8}{h}$$

represents the derivative of some function $f$ at some number $a$. Determine $f$ and $a$, and use this information to evaluate the limit.

3. A plane flies at 600 km.hr in an 80 km/hr wind, which is blowing at an angle of $7\pi/4$ from the positive $x$-axis. In what direction should the plane fly so that its velocity relative to the ground is in the $i$ direction? Give your angle as a decimal accurate to within .0002 radians.

4. Given the function

$$f(x) = (2x^2 - 5x + 3)(2x^2 - 9x + 10),$$

find an equation for the tangent line to the graph of $f$ at the point $x = 2$.

5. The position of a moving body is given, as a function of $t$, by

$$s(t) = \frac{t + 4}{t^2 + 9}, \quad -\infty < t < \infty.$$ 

Find all times at which the body is instantaneously at rest and all intervals during which it is moving in the positive direction.

6. Determine whether $\lim_{x \to 0} \frac{\tan 1000x}{x}$ exists. If the limit exists, evaluate it.