Exam 2 MTH 201 Fall 2011

To receive full credit, answers must be accompanied by complete, correct justification that is both legible and organized properly. No Calculators.

1. (10 pts) Find the derivative of $f(x) = 7\cos(4x)$ using the definition of the derivative. No partial credit will be given for using short-cut methods.

2. (30 pts) Differentiate and simplify completely.

   (a) $f(x) = 3x^5 - 4x^\pi + x - \ln 2 + 6e^x + 7^x$

(b) $y = \dfrac{4w+3}{\sqrt{w^2+w}}$

(c) $g(t) = e^{5t+1} + \sin^4(5t+1) + \sec^3(5t+1)$

3. (30 pts) Differentiate. (You don't need to simplify after you differentiate.)

(a) $y = w\cos^4(2w) + \tan^{-1}(3w) + \sin^{-1}(4w^3 + w)$

(b) $f(x) = \ln\left(\dfrac{xe^{3x}}{(5x^2+x)^6\sqrt{2x+3}}\right)$

(c) $h(\theta) = e^{\tan(\sin(3\theta^2+4))}$

4. (10 pts) Use logarithmic differentiation to find the derivative of $y = x^{\ln x}$.

5. (10 pts) Given $4x^2 - e^{x-y} = \cos(xy) - 2$, find $\frac{dy}{dx}$ by implicit differentiation.

6. (10 pts) A balloon ascends straight up at a rate of 20 ft/min. An observer watches from a distance of 12 feet from the launch point (on the ground). At what rate is the distance from the observer's feet to the balloon increasing when the balloon is 16 feet from the ground? Note: To receive credit for this problem, you need to use Calculus.