MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

Math 2000 **Assignment 8** **Due Wed March 29, 2006**

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1. Use the Chain Rule to find $\dfrac{dw}{dt}$, given $w = \cos(x - y)$ with $x = t^2$ and $y = 1$.

2. Use the Chain Rule to find $\dfrac{\partial w}{\partial s}$ and $\dfrac{\partial w}{\partial t}$, given $w = x\cos(yz)$, with $x = s^2$,$y = t^2$ and $z = s - 2t$.

3. Let $w = \dfrac{yz}{x}$ with $x = \theta^2, y = r + \theta$ and $z = r - \theta$. Find $\dfrac{\partial w}{\partial r}$ and $\dfrac{\partial w}{\partial \theta}$, by:
   (a) using the Chain Rule
   (b) converting w to a function of r and θ before differentiating.

4. Show that function $w = (x - y)\sin(y - x)$ with $x = u - v, y = v - u$, satisfies the equation
$$\frac{\partial w}{\partial u} + \frac{\partial w}{\partial v} = 0.$$

5. Differentiate implicitly to find $\dfrac{dy}{dx}$, given $\cos x + \tan xy + 5 = 0$.

6. Differentiate implicitly to find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$:
   (a) $z = e^x \sin(z + y)$
   (b) $x \ln y + y^2 z + z^2 = 8$.

7. Examine each function for relative extrema.
   (a) $f(x, y) = |x + y| - 2$,
   (b) $z = -3x^2 - 2y^2 + 3x - 4y + 5$.

8. Determine whether there is a relative maximum, a relative minimum, a saddle point, or insufficient information to determine the nature of the function $f(x, y)$ at the critical point $f_{xx}(x_0, y_0) = -3, f_{yy}(x_0, y_0) = -8, f_{xy}(x_0, y_0) = 2$.

9. Find the absolute extrema for the function f over the region R.
(In each case R contains the boundaries).
   (a) $f(x, y) = 2x - 2xy + y^2$,
   R : the region in the xy-plane bounded by the graphs of $y = x^2$ and $y = 1$.
   (b) $f(x, y) = x^2 - 4xy + 5$,
   $R = \{(x, y) : 0 \leq x \leq 4, 0 \leq y \leq \sqrt{x}\}$.