MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

Mathematics 2000 **Assignment 8** **Winter 2004**

Due March 24

1. Use the Chain Rule to find $\dfrac{dv}{dt}$, given $v = \tan(2x + 3y)$ with $x = t^3$ and $y = t^{1/3}$.

   Find value $\dfrac{dv}{dt}$ at $t = 1$.

2. Use the Chain Rule to find $\dfrac{\partial v}{\partial s}$ and $\dfrac{\partial v}{\partial t}$, given $v = x(y + 2z)^{1/2}$, with $x = s^2/t$, $y = t^2 + s^2$ and $z = -st$.

   Find $\dfrac{\partial v}{\partial s}$ at $s = 1$, $t = 2$.

3. Differentiate implicitly to find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$:

   (a) $x^3 + y^3 + z^3 = xy + yz + xz$
   (b) $x - y = \arctan(yz)$
   (c) $xyz = \sin(x + 2y + 3z)$.

4. 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

   (a) $f_{xx}(x_0, y_0) = 3$, $f_{yy}(x_0, y_0) = -8$, $f_{xy}(x_0, y_0) = 3$.
   (b) $f_{xx}(x_0, y_0) = 3$, $f_{yy}(x_0, y_0) = 8$, $f_{xy}(x_0, y_0) = 3$.
   (c) $f_{xx}(x_0, y_0) = -2$, $f_{yy}(x_0, y_0) = -8$, $f_{xy}(x_0, y_0) = -4$.
   (d) $f_{xx}(x_0, y_0) = -2$, $f_{yy}(x_0, y_0) = -8$, $f_{xy}(x_0, y_0) = 2$.

5. Find and classify critical points.

   (a) $f(x, y) = 10 - x^2 - y^2 + xy$
   (b) $f(x, y) = 10 + x^3 + y^3 - 3xy$

6. Calculate the iterated integral.

   a) $\displaystyle\int_0^2 \int_0^4 (1 + x + 2y)\, dxdy$
   b) $\displaystyle\int_0^2 \int_0^4 (1 + x + 2y)\, dydx$
   c) $\displaystyle\int_1^2 \int_0^{\pi/2} x \sin(xy)\, dydx$
   d) $\displaystyle\int_0^{\ln 2} \int_0^{\ln 3} y e^{x+y^2}\, dxdy$
   e) $\displaystyle\int_1^2 \int_2^4 \frac{x^2}{y}\, dxdy$
   f) $\displaystyle\int_0^1 \int_0^1 \frac{x^2 y}{\sqrt{x^3 + y^2 + 10}}\, dydx$
   g) $\displaystyle\int_0^{0.5} \int_0^1 \frac{1 + x^2}{1 - y^2}\, dxdy$
   h) $\displaystyle\int_0^{\pi} \int_0^{\pi/2} \cos(x - y)\, dydx$