Test 2

DATE: March 13, 2008

COURSE: <u>MATH 2130</u>

NAME:_____

STUDENT # : _____

There are 5 questions of total mark 50.

[12]   1. Evaluate each of the following limit or explain why it does not exist.

(a) $\displaystyle \lim_{(x,y)\to(0,0)} \frac{x^3 + xy^2 - 2x^2y}{x^2y + 9xy^2}$

(b) $\displaystyle \lim_{(x,y)\to(2,2)} \frac{2x^2 + 2xy + 2x - xy^2 - y^3 - y^2}{2x^3 - 2x^2y + 2x - x^2y^2 + xy^3 - y^2}$

[6] 2. Given that $z = f(u, v, x)$, $u = g(x, y)$ and $v = h(x)$; find a formula for $\dfrac{\partial z}{\partial x}$.

[10] 3. Let $u = e^{s+t} + \cos t$, find $\dfrac{du}{dx}$ if

$$x^3 t + tx^2 - 4 = 0 \qquad \text{and} \qquad e^s - s^3 x^2 + 1 = 0 \,.$$

[10] 4. Find the directional derivative of the function

$$f(x, y, z) = \frac{1}{3} x^3 + y^2 - z^2$$

at the point $(-1,\, 1,\, 3)$ along the line of intersection of the two planes $2x + y + 1 = 0$ and $x + y - z = -3$ in the direction of increasing x.

[12]   5. Find **all** critical points for the function

$$f(x, y) = e^{\, y^2 - xy^2 + \frac{1}{2}x^2}.$$

Choose **only** one critical point and determine if it is a relative maximum, a relative minimum, or a saddle point. Show your work.