

Test 2

DATE: March 13, 2008
COURSE: MATH 2130

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TIME: 70 minutes
EXAMINER: G.I. Moghaddam

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

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

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

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

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

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

- [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

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

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

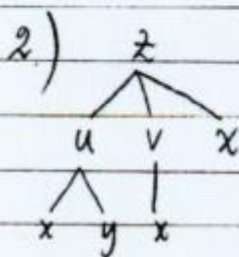
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Answers to Math 2130 March 13/2008 Test 2
by dawit yohannes

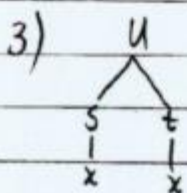
1) a) limit does not exist. (try to sub. $y = mx$ and show limit dependence on m (approach))

b) 5 (hint: try factorization and Cancellation)

(attention)



$$\frac{\partial z}{\partial x} = \frac{\partial z}{\partial u} \frac{\partial u}{\partial x} + \frac{\partial z}{\partial v} \frac{\partial v}{\partial x} + \frac{\partial z}{\partial x} \Big|_{u,v}$$



$$\frac{du}{dx} = \frac{\partial u}{\partial s} \frac{ds}{dx} + \frac{\partial u}{\partial t} \frac{dt}{dx}$$

$$= e^{s+t} \left(\frac{2xs^3}{e^s - 3s^2x^2} \right) + (smt - e^{s+t}) \left(\frac{3x+2}{x^2+x} \right) t$$

4.) $-\frac{3}{\sqrt{6}} = -\frac{\sqrt{6}}{2}$

5) critical points: $(0,0), (1,-1), (1,1)$

$(0,0)$ yields relative-min

$(1,-1)$ yields Saddle point

$(1,1)$ yields Saddle point