

Values

- 6 1. Evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{2x^4 + 3y^2}{3x^4 - 2x^2y + y^2}$, if it exists. If the limit does not exist. Explain why not.
- 11 2. If $z = u^2 - 2v^2 + uvw$, $u = \left(\frac{x+y}{x-2y}\right)^2$, $v = xe^{3x}$, and $w = \tan(2x + 4y)$, use a chain rule to find $\frac{\partial z}{\partial x}\bigg|_y$. Do not simplify your answer.
- 9 3. Find the rate of change of the function $f(x, y, z) = \sin(xy) - z^3$ at the point $(2, 0, 3)$ in the direction of the upward normal to the surface $xz^2 - x^2z = 6$. The upward normal has a positive z -component.
- 7 4. The equations
- $$x^3 + xy - uy = v + 4, \quad y^2 - xy^3 + uv = 1,$$
- define x and y as functions of u and v . Find $\frac{\partial x}{\partial v}$.
- 7 5. Find all critical points for the function
- $$f(x, y) = x^3y^3 - x^2y^2 + 6.$$

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Answers to Math 2130 Test 2, 2009 (Perry and Grim) (Fall)

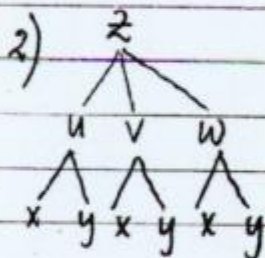
1) limit does not exist

try to Subr. $y = mx^2$ to get a result of the limit as

$$\frac{2+3m^2}{3-2m+m^2} \text{ whose value depends on } m.$$

→ along the x -axis the limit is $\frac{2}{3}$
($y=0$)($m=0$)

→ along the y -axis the limit is 3.
($x=0$)($m \rightarrow \infty$)



$$\frac{\partial z}{\partial x} = \frac{\partial z}{\partial u} \frac{\partial u}{\partial x} + \frac{\partial z}{\partial v} \frac{\partial v}{\partial x} + \frac{\partial z}{\partial w} \frac{\partial w}{\partial x}$$

$$= (2u+vw)(2) \left(\frac{x+y}{x-2y} \right) \left[\frac{(x-2y)(1) - (x+y)(1)}{(x-2y)^2} \right]$$

$$+ (-4v+uw) [e^{3x} + x e^{3x} \cdot 3] + uv \sec^2(2x+4y) \cdot 2$$

$$3) \Delta_{\vec{n}} f|_p = \nabla f|_p \cdot \hat{n} = (0, 2, -27) \cdot \frac{(-3, 0, 8)}{\sqrt{73}} = \frac{-8(27)}{\sqrt{73}} = \frac{-216}{\sqrt{73}}$$

$$4) \frac{\partial x}{\partial v} = \frac{2y - 3xy^2 + u(x-u)}{(3x+y)(2y-3xy^2) + y^3(x-u)}$$

5) CPs: $(0, y)$ - all points along the y -axis,
 $(x, 0)$ - all points along the x -axis and
all points on the curve $xy = \frac{2}{3}$