Quiz 14.1 - 14.5 _____ Name: Key

Show all work and circle answers. 15 pts. Per.: _____

No Calculators. 3 points each.

1) Where is the function $f(x,y)=\dfrac{\sqrt{x}}{x-y^2}$ continuous?

All points (x,y) such that $x \geq 0$ and $x \neq y^2$

OR

All points except when $x<0$ or $x=y^2$

2) Evaluate $\dfrac{\partial}{\partial y}\left[\dfrac{x^4-y}{x^2+y}\right]$.

$\frac{d}{dy}\left[(x^4-y)(x^2+y)^{-1}\right]$ ↘ product rule

$=(-1)(x^2+y)^{-1}+(x^4-y)(-1)(x^2+y)^{-2}(1)$

$=\dfrac{-1}{x^2+y}-\dfrac{x^4-y}{(x^2+y)^2}$

$=\dfrac{-1(x^2+y)-(x^4-y)}{(x^2+y)^2}$ ← Quotient Rule also works

$=\dfrac{-x^2-y-x^4+y}{(x^2+y)^2}$ ← $\dfrac{-x^2-x^4}{(x^2+y)^2}$

3) Find $\dfrac{\partial^2}{\partial y \partial x}\left[\dfrac{4x^2}{y}+\dfrac{y^2}{2x}\right]$. Be sure to differentiate in the correct order.

Let $f(x,y)=\dfrac{4x^2}{y}+\dfrac{y^2}{2x}$

$\dfrac{df}{dx}=\dfrac{8x}{y}-\dfrac{y^2}{2x^2}$

$\dfrac{\partial^2 f}{\partial y \partial x}=-\dfrac{8x}{y^2}-\dfrac{2y}{2x^2}$

Check that x derivative is first, then y

Important

$=\dfrac{-8x}{y^2}-\dfrac{y}{x^2}$

4) Let $w(x,y,z)=xy^2+xz^2$, $x(s,t)=t+1$, $y(s,t)=t-1$, and $z(s,t)=st$. Using the appropriate chain rule, find

(a) $\dfrac{\partial w}{\partial t}$ in general & (b) $\dfrac{\partial w}{\partial t}$ when $t=0$, $s=1$.

all ∂, Not d

(a) $\dfrac{\partial w}{\partial t}=\dfrac{\partial w}{\partial x}\dfrac{\partial x}{\partial t}+\dfrac{\partial w}{\partial y}\dfrac{\partial y}{\partial t}+\dfrac{\partial w}{\partial z}\dfrac{\partial z}{\partial t}$

$\dfrac{\partial w}{\partial t}=(y^2+z^2)(1)+(2xy)(1)+(2xz)(s)$

$=(t-1)^2+(st)^2+2(t+1)(t-1)+2(t+1)(st)s$

$=t^2-2t+1+s^2t^2+2t^2-2+2s^2t^2+2s^2t$

$=3t^2-2t-1+3s^2t^2+2s^2t$

(b) $\left.\dfrac{\partial w}{\partial t}\right|_{\substack{t=0\\s=1}}=3(0)^2-2(0)-1+3(1)^2(0)^2+2(1)^2(0)$

$=-1$

Indicate when pluggin in values. This will be checked for notation on tests.

5) Write the symbolic expression for the *definition* of the first partial derivative of $f(x,y)$ with respect to x.

$f_x(x,y)=\dfrac{\partial f}{\partial x}(x,y)$

$=\lim_{\Delta x \to 0}\dfrac{f(x+\Delta x,y)-f(x,y)}{\Delta x}$

Bonus) Explain what a partial derivative of f means in terms of the graph of f. (+2 pts.)

A partial derivative is the slope of the graph in the direction parallel to the positive axis for the variable that you are taking the partial derivative w/respect to.

Contour Quiz

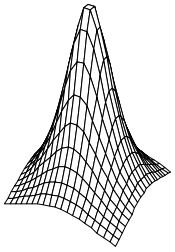
_____ 5 pts.

Name: Key

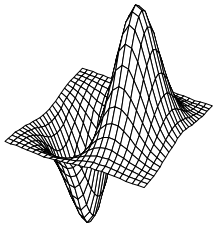
Per.: ____

Write the letter of the level curve graph that matches the three-dimensional surface. (1 point each.)

C 1.



A 2.



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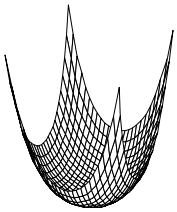

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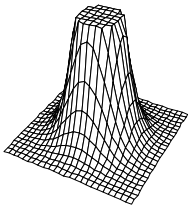
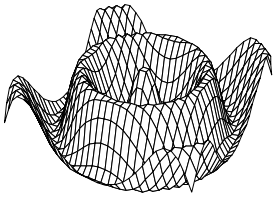


B 5.



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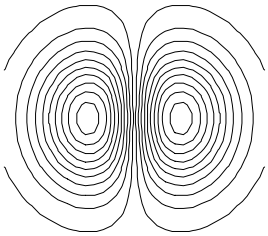

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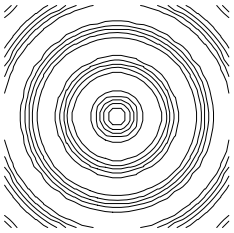

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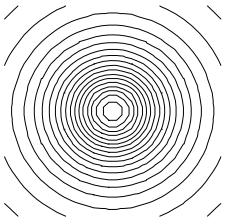

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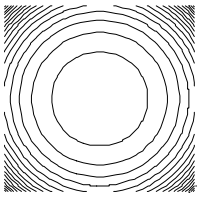

E.