data

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Questão 1

$\ln\sqrt{x^2+y^2}$

$\ln(x^2+y^2)^{1/2}$

derivada parcial em relação a x:

$f_x(x,y) = \frac{1}{(x^2+y^2)^{1/2}} \cdot (x^2+y^2)^{1/2}$

$= \frac{1}{(x^2+y^2)^{1/2}} \cdot \frac{1}{2} \cdot 2x(x^2+y^2)^{1/2-1}$

$= \frac{1}{(x^2+y^2)^{1/2}} \cdot x(x^2+y^2)^{-1/2}$

$= \frac{x}{(x^2+y^2)^{1/2}} \times \frac{1}{(x^2+y^2)^{1/2}}$

$= \frac{x}{(x^2+y^2)}$ ou seja

derivada em relação y

$f_y(x,y) = \frac{1}{(x^2+y^2)^{1/2}} \cdot (x^2+y^2)^{1/2}$

$f_y(x,y) = \frac{1}{(x^2+y^2)^{1/2}} \cdot \frac{1}{2} \cdot 2y \cdot (x^2+y^2)^{1/2-1}$

$= \frac{1}{(x^2+y^2)} \cdot \frac{2y}{2} \cdot (x^2+y^2)^{-1/2}$

$= \frac{1}{(x^2+y^2)^{1/2}} \cdot y \cdot (x^2+y^2)^{-1/2}$

$= \frac{y}{(x^2+y^2)^{1/2}} \cdot \frac{1}{(x^2+y^2)^{1/2}}$

$= \frac{y}{(x^2+y^2)}$

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questão 6

$x^3 - xy + 4xz - 5 = 0$

F é diferenciável

$\frac{\partial F}{\partial y}(x,y) = 3x^2 - y + 4z,$

$\frac{\partial F}{\partial z}(x,y) = -x$

e $\partial F(x,y) = 4x \neq 0$

$F(x,y) = 0 \Rightarrow$

$\frac{\partial F}{\partial x}(x,y,z) \cdot \frac{\partial x}{\partial x} + \frac{\partial F}{\partial y}(x,y,z) \cdot$

$\frac{\partial y}{\partial x} + \frac{\partial F}{\partial z}(x,y,z) \cdot \frac{\partial z}{\partial x}(x,y) = 0$

como x e y são variáveis e não funções $\frac{\partial x}{\partial x} = 1$ e

$\frac{\partial y}{\partial x} = 0$

Questão 5

b) $f(x,y) = \frac{x+y}{x-y}$

$\frac{u}{v} = \frac{u'v - uv'}{v^2}$

calculo a derivada em relação a x

$= \frac{(x+y)(x-y) - \frac{\partial}{\partial x}(x-y)(x+y)}{(x-y^2)}$

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

$\boxed{\frac{\partial f}{\partial x} = \frac{-2y}{(x-y)^2}}$

derivando em relação a y

$fy(x,y) = \frac{\frac{\partial}{\partial y}(x+y)(x-y) - \frac{\partial}{\partial y}(x-y)(x+y)}{(x+y)^2}$

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

$= \frac{x-y-(-x-y)}{(x-y)^2} = \frac{x-y+x+y}{(x-y)^2}$

$\boxed{= \frac{2x}{(x-y)^2}}$

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Questão 4

a) f 1⋅1

$$\frac{\partial}{\partial x}\left(\operatorname{sen}(x,y,z)+x^2\cdot\frac{y^3}{z}\right.$$

$$=\frac{\partial}{\partial x}\left(\operatorname{sen}(x,y,z)+\frac{\partial}{\partial x}\left(\frac{x^2y^3}{z}\right)\right.$$

Aplicando a soma

$$\frac{\partial}{\partial x}(\operatorname{sen}(x,y,z))=\cos(x,y,z)yz$$

$$\frac{\partial}{\partial x}\left(\frac{x^2y^3}{z}\right)=\frac{2y^3x}{z} \qquad \boxed{\frac{\partial}{\partial x}=\cos(x,y,z)yz+\frac{2y^3x}{z}}$$

$$\frac{\partial}{\partial y}(\cos(x,y,z)yz)+\frac{2y^3x}{z}$$

$$=\frac{\frac{\partial}{\partial y}(\cos(xyz)yz)z}{z}+\frac{2y^3x}{z} \qquad \frac{\partial}{\partial y}=\frac{\frac{\partial}{\partial y}(\cos(xyz)yz)z+2y^3x}{z}$$

$$\frac{\partial}{\partial x}=\frac{1}{z}\frac{\partial}{\partial x}\left((x,y,z)\left(\frac{\partial}{\partial y}(\cos(xyz)yzz)+2y^3x\right)\right)$$

$$\frac{\partial}{\partial x}=(\cos(xyz)yzz)=z^2(-2zx^2\operatorname{sen}(zx^2)+2zx^3\cos(zx^2)+2y^3$$

$$\frac{\partial}{\partial y}(\cos(xyz)yzz)=z^2(-2zx^2\operatorname{sen}(zx^2)+\cos(zx^2))$$

$$\frac{\partial}{\partial x}=\frac{1}{z}(y,z\cdot 1)(z^2(-2zx^2\operatorname{sen}(zx^2)+\cos(zx^2)+2y^3x)+(-z^3(2x\operatorname{sen}(zx^2)+2zx^3\cos(zx^2)+2y^3)(x,y,z)$$

data

b) f_{yyx}

$$\frac{\partial}{\partial y}(\operatorname{sen}(xyz) + x^2 y^3/z$$

$$= \frac{\partial}{\partial y}(\operatorname{sen}(xyz) + \frac{\partial}{\partial y}\left(\frac{x^2y^3}{z}\right)$$

$$\frac{\partial}{\partial y}\operatorname{sen}(xyz) = \cos(xyz)xz$$

$$\frac{\partial}{\partial y}\left(\frac{x^2y^3}{z}\right) = \frac{3x^2y^2}{z} \quad \Rightarrow \quad \boxed{\cos(xyz)xz + \frac{3x^2y^2}{z}}$$

$$= \frac{\frac{\partial}{\partial y}(\cos(xyz)xz)z}{z} + \frac{3x^2y^2}{z}$$

$$\boxed{\frac{\partial}{\partial y} = \frac{\cos(xyz)xz)z + 3x^2y^2}{z}}$$

Retirando constante

$$= \frac{1}{z}\left(\frac{\partial}{\partial x}(\cos(xyz)xzz) + \frac{\partial}{\partial x}(3x^2y^2)\right)$$

$$\frac{\partial}{\partial x}\cos(xyz)xzz = z^2(-yzx\sin(yzx) + \cos(yzx)$$

$$\frac{\partial}{\partial x}(3x^2y^2) = 6y^2x$$

$$\boxed{= z^2(-xyz\sin(xyz) + \cos(xyz)) + 6xy^2}$$

data

a) f 33z

$$\frac{\partial}{\partial z}\left(\operatorname{sen}(xyz) + \frac{x^2y^3}{z}\right)$$

$$= \frac{\partial}{\partial z}\left(\operatorname{sen}(xyz) + \frac{x^2y^3}{z}\right)$$

$$= \frac{\partial}{\partial z}(\operatorname{sen}(xyz)) = \cos(xyz)xy$$

$$\boxed{= \cos(xyz)xy - \frac{x^2y^3}{z^2}}$$

$$= \frac{\frac{\partial}{\partial z}(\cos(xyz)xy)z^2}{z^2} - \frac{x^2y^3}{z^2}$$

$$\boxed{\frac{\partial}{\partial z}\,\frac{(\cos(xyz)xy)z^2 - x^2y^3}{z^2}}$$

$$\frac{\partial}{\partial y} = \frac{1}{z^2}\left(\frac{\partial}{\partial y}(\cos(xyz)xyz^2) - \frac{\partial}{\partial y}(x^2y^3)\right)$$

$$= xz^2(-xz\operatorname{sen}(xzy) + \cos(xzy)$$

$$\frac{\partial}{\partial y}(x^2y^3) = 3x^2y^2$$

$$\boxed{= \frac{xz^2(-xyz\operatorname{sen}(xyz) + \cos(xyz)) - 3x^2y^2}{z^2}}$$

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Questão 5

a) $f(x,y) = x^3 e^x + 10y$

derivando em relação a x

$f(x,y)\ \frac{\partial}{\partial x}(x^3 e^x) + \frac{\partial}{\partial x}(10y)$

$= (x^3 e^x) = 3x^2 e^x + e^x x^3$

$\partial(10y = 0$

$= 3x^2 e^x + e^x x^3 + 0$

Derivando em relação y

$f(x,y) = \frac{\partial}{\partial y}(x^3 e^x) + \frac{\partial}{\partial y}(10y)$

$\frac{\partial}{\partial y}(10y) = 10$

$= 0 + 10$

$= 10$

b) $f(x,y = 2y^2 \ln(x)$

derivando em relação a x

$= 2y^2 \frac{\partial}{\partial x} \ln(x)$

$\ln x = 1/x$

$= 2y^2 \frac{1}{x}$

$= 2y^2 \frac{1}{x} \cdot \frac{2y^2}{x} = \frac{2y^2}{x}$

derivando em relação a y

$\frac{\partial}{\partial y} 2y^2 \ln(x)$

$f(x,y) = 2\ln(x) \frac{\partial}{\partial y}(y^2)$

$= 2\ln(x) \cdot 2y^{2-1}$

$= 4y \ln(x)$

c) $f(x,y) = 3y^2 \cos(x)$

derivando em relação a x

$= 3y^2 \frac{\partial}{\partial x} \cos(x)$

$\cos x = -\operatorname{sen}(x)$

$f(x,y) = 3y^2(-\operatorname{sen}(x))$

$= -3y^2 \operatorname{sen}(x)$

derivando em relação y

$f_y(x,y) = 3\cos(x) \frac{\partial}{\partial y}(y^2)$

$= 3\cos(x) \cdot 2y^{2-1}$

$f(y)(x,y) = 6y\cos(x)$

d) $4y^2 e^y + 6x^2$

derivada em relação a x

$f_x(x,y) = \frac{\partial}{\partial x}(4y^2 e^y) + \frac{\partial}{\partial x}(6x^2)$

$\frac{\partial}{\partial x}(4y^2 e^y) = 0$

$\frac{\partial}{\partial x}(6x^2) = 12x$

$f(x)(x,y) = 0 + 12x$

$f_x(x,y) = 12x$

data

derivando em relação a y

$\frac{\partial}{\partial y}(4y^2 e^y + 6x^2)$

$f_y(x,y) = \frac{\partial}{\partial y}(4y^2 e^y) + \frac{\partial}{\partial y}(6x^2)$

$\frac{\partial}{\partial y}(4y^2 e^y) = 0$

$4(2y e^y + e^y y^2$

$\frac{\partial}{\partial y}(6x^2) = 0$

$f_y(x,y) = 4(2y e^y + e^y y^2 + 0$

$f_y(x,y) = 4(e^y y^2 + 2e^y y$

E) $f(x,y) = 20x^2 y^2 \operatorname{sen}(x)$

derivando em relação a x

$f(x,y) = 20y^2 \frac{\partial}{\partial x}(x^2 \operatorname{sen}(x)$

$(f \cdot g)' = f' \cdot g + f \cdot g'$

$f = x^2 \cdot g = \sin(x)$

$= 20y^2 (\frac{\partial}{\partial x})(x^2) \operatorname{sen}(x)$

$\frac{\partial}{\partial x} \operatorname{sen}(x)(x^2)$

$\frac{\partial}{\partial x}(x^2) = 2x$

$\frac{\partial}{\partial x}(\operatorname{sen}(x)) = \cos$

$= 20y^2(2x\sin(x) + \cos(x)x^2)$

derivando em relação y

$\frac{\partial}{\partial y} = 20x^2 y^2 \operatorname{sen}(x)$

$f(x,y) = 20x^2 \sin(x) \frac{\partial}{\partial y}(y)^2$

$f_y(x,y) = 20x^2 \sin x + 2y^{2-1}$

$f_y(x,y) = 40x^2 y \sin(x)$

8) $f(x,y) = \frac{e^x}{2x+3y}$

derivando em relação a x

$\frac{u'}{v} = \frac{u'v - v'u}{v^2}$

$f_x(x,y) = \frac{\frac{\partial}{\partial x}(e^x)(2x+3y) - \frac{\partial}{\partial x}(2x+3y)}{(2x+3y)^2}$

$\frac{\partial}{\partial x}(e^x) = e^x$

$\frac{\partial}{\partial x}(2x+3y) = 2$

$= \frac{e^x(2x+3y) - 2e^x}{(2x+3y)^2}$

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derivando em relação a y,

$$fx(x,y) = e^x \frac{\partial}{\partial y}\left(\frac{1}{2x+3y}\right) \quad ps: \frac{1}{a} = a^{-1}$$

$$fy(x,y) = e^x \frac{\partial}{\partial y}(2x+3y)^{-1}$$

Aplicar regra da cadeia

$$-\frac{1}{(2x+3y)^2} \frac{\partial}{\partial y} 2x+3y$$

$$\frac{\partial}{\partial y}(2x+3y) = 3$$

$$= e^x\left(-\frac{1}{(2x+3y)^2} \cdot 3\right) = -\frac{3e^x}{(2x+3y)^2}$$

$$fy(x,y) = \frac{-3e^x}{(2x+3y)^2}$$

data

questão 2

a) $f(x,y) = x^2y^3 + x^3y^2$

$\begin{cases} x(t) = 1/t \\ y(t) = 1/t^2 \end{cases}$

$\frac{dy}{dt} = \frac{\partial f}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial f}{\partial y} \cdot \frac{dy}{dt}$

$\frac{\partial f}{\partial x} = 2x \cdot y^3 + 3x^2 \cdot y^2$

$\frac{\partial f}{\partial y} = 3y^2 \cdot x^2 + 2y\, x^3$

sabe que: $1/t = t^{-1}$

e $1/t^2 = t^{-2}$

$\frac{dx}{dt} = -1 \cdot t^{-1-1} = t^{-2} = -1/t^2$

$\frac{dy}{t} = -2t^{-2-1} = -2t^{-3} = \frac{-2}{t^3}$

$\frac{dx}{dt} = (2x \cdot y^3 + 3x^2 \cdot y^2) \cdot (-1/t^2) +$

$(3y^2 \cdot x^2 + 2y \cdot x^3) \cdot (-2/x^2)$

trocamos x e y

$= \frac{2}{1} \cdot \left(\frac{1}{t}\right) \cdot \left(\frac{1}{t^2}\right)^3 + \frac{3}{1}\left(\frac{1}{t^2}\right)^2 \cdot \left(\frac{1}{t^2}\right)^2 + \frac{0}{1}x$

$\left(\frac{1}{t^2}\right)^2 + \frac{2}{1}\left(\frac{1}{t}\right) \cdot \left(\frac{1}{t}\right)^3 \cdot \left(\frac{-2}{t^3}\right)$

$= \left(\frac{2}{t^7}\right) + \left(\frac{-3}{t^3}\right) + \left(\frac{3}{t^6}\right) + \left(\frac{-4}{t^8}\right)$

$= \left(\frac{-7}{t^8}\right) + \left(\frac{2}{t^7}\right) + \left(\frac{3}{t^6}\right)$

$\boxed{\text{a) } \frac{d}{dt} = \left(\frac{-7}{t^8}\right) + \left(\frac{2}{t^7}\right) + \left(\frac{3}{t^6}\right)}$

B) $f(x,y) = e^{x+y}$

$\begin{cases} x(t) = t^2 \\ y(t) = 2t^3 - 1 \end{cases}$

$\frac{dz}{dt} = \frac{\partial f}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial}{\partial y} \cdot \frac{dy}{dt}$

$= e^{x+y} \cdot 2t + e^{x+y} \cdot 6t^2$

$= e^{x+y} \cdot (6t^2 + 2t)$

$\boxed{\frac{dz}{dt} = e^{t^2 + 2t^3 - 1} \cdot (6t^2 + 2t)}$

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questão 3

a) calcula fx(10, 15)

$$\frac{\partial f}{\partial x} = \frac{1}{e^{x^4} - x^2 \cdot y^3} \, e^{x^4} \cdot 4 - 2x \cdot y^3$$

$$= \frac{e^{x^4} \cdot 4 - 2xy^3}{e^{x^4} - x^2 y^3} \Rightarrow \frac{y - 2x}{-x^2}$$

$$(10, 15) = \frac{15 - 2(10)}{(-10)^2} = \underline{\underline{-0{,}05}}$$

b) $f(11, 15 = \ln(e^{11+15} - 11^2 \cdot 15^3$

$= \cancel{\ln}(\cancel{e^{165}}\ = \ln(e^{165} - 121 \cdot 3 \cdot 375)$

$\underline{\underline{f(11, 15) = 165}}$

$f(10, 15) = \ln(e^{10-15} - 10^2 \cdot 15^3)$

$= \ln(e^{150} - 100 \cdot 3375)$

$f(10, 15) = \underline{\underline{150}}$

c) $f(y)\,(10, 15)$

$$\frac{\partial f}{\partial y} = \frac{1}{e^{x^4} - x^2 y^3} \cdot e^{x^4} \cdot x - 3x^2 \cdot y^2$$

$$= \frac{e^{x} \cdot x - 3x^2 y^2}{e^{x^4} - x^2 \cdot y^3} = \frac{x - 3}{-4}$$

Questão 7

$3xy^2+x^3-3x$	posso dizer ~~o ponto~~
derivando a função	
$f(x,y) = 3y^2+3x^2-3$	$(0,1)$ -36 6
	$0,1)$ -36 -6
$f_y(x,y) = 6xy$	
	o ponto ~~máximo~~ e mínimo
fazer a igualdades	é $(1,0)$
das derivas	
$3y^2+3x^2-3=0$	3) $f(x,y) = 2x^3+3y^2$
$3x^2+3y^2=3$	(x,y) varia de $(1,2)$ a $(0{,}95, 2{,}05)$
$x^2+y^2 = 1$ $(*)$	acha Δz e dz
$6xy=0$ $(**)$	$dz = \frac{\partial f}{\partial x} \cdot dx + \frac{\partial f}{\partial y} \cdot dy$
$x=0,\ y=0 \Rightarrow$ se $x=0$	$\boxed{dz = 6x^2 \cdot dx + 6y \cdot dy}$
substituindo	
$y=1,\quad y=-1$	
se $y=0$ substituindo	
$x=1$ e $y=-1$	
$f^x(x,y) = 6x$	
$f_y^y(x,y) = 6x$	
$f_{xy}(x,y) = 6y$	
$H(x,y) = 6x \cdot 6x - (6y)^2$	
$H(x,y) = 36x^2 - 36y^2$	
Então neste caso	