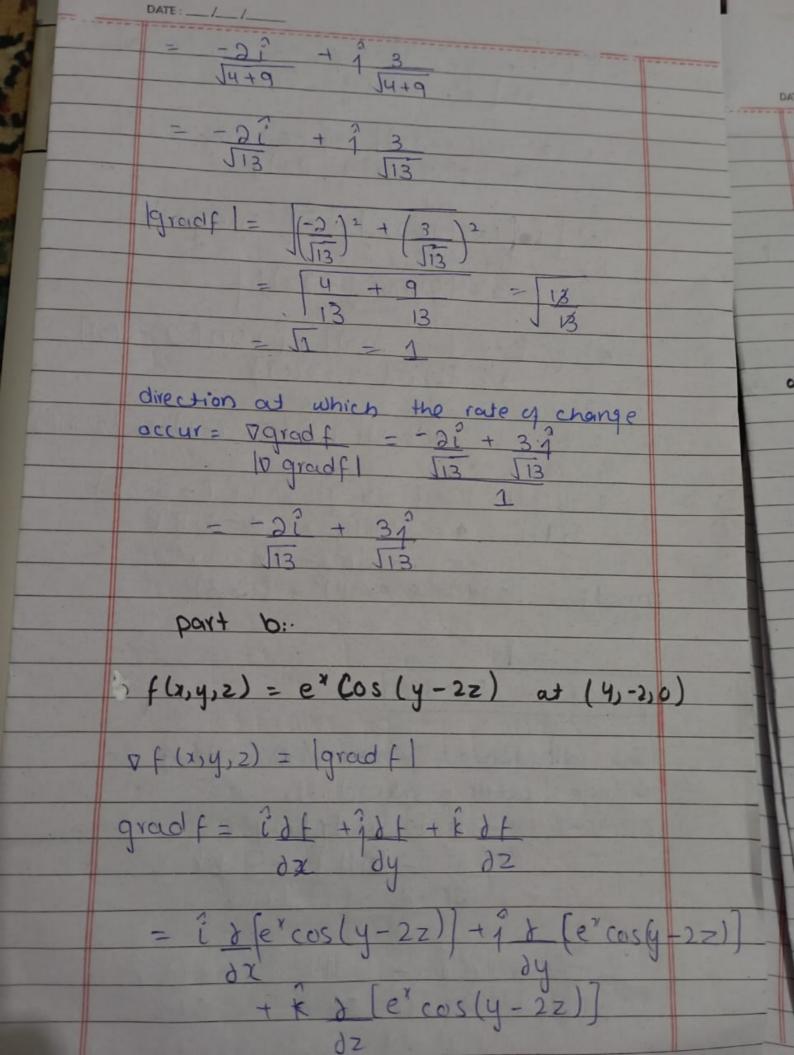
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E(21415)

F(xy,z) = 4xy2 exx -1+41+28 grad f = îd f + j df + kdf $= \frac{1}{2} \frac{1}{3} \frac{1}{4} \frac{1}{3} \frac{1}{3} \frac{1}{4} \frac{1}{4} \frac{1}{3} \frac{1}{4} \frac{$ $= \frac{1}{2} \left[\frac{1}{4} \left(\frac{3x^2}{2} + \frac{3x^2}{2} + \frac{1}{4} \right) + \frac{1}{4} \left(\frac{3x^2}{4} + \frac{3x^2}{4} + \frac{3x^2}{4} \right) + \frac{1}{4} \left(\frac{1}{4} + \frac{1}{4}$ $= i \left(4y^2 e^{3x^2} + 12xy^2 z e^{3x^2} \right) + i \left(8xy^3 e^{3x^2} \right)$ $+ i \left(12x^2y^2 e^{3x^2} \right)$ $= e^{3x^2} \left[i \left(4y^2 + 12xy^2 \right) + i \left(8xy \right) + i \left(12x^2y^2 \right) \right]$ $e^{3(3)(0)}[[(4(-1)^2+12(+3)(-1)^2(0)]+$ $[(8(3)(-1)]+k[12(3)^2(-1)^2]$ = e° [42 - 241 + 108k] - 42 - 241 + 108k

direction derivale = à grad f 121 (-i+41 +28) - (41-241-1088) -= 1 [-4-96+216) - 1 (116) 910 Question No: 04 Find maximum route of change of the function at the indicated point and dine direction in which this rate of change OCCUYS . f(x,y) = 1x2+y2 at (-2,3) (a) Vf (x,y) = lgrowf) groudf = idt + jdf = $\frac{1}{2} \frac{1}{2} (x^2 + y^2)^2 + \frac{1}{2} \frac{1}{2} (x^2 + y^2)^2$ = $\frac{1}{2} \left[\frac{1}{x^2 + y^2} + \frac{1}{2} \left[\frac{1}{x^2 + y^2} \right] \right]$ $\frac{1}{2}\left[\frac{x}{\sqrt{x^2+4^2}}\right] + \frac{1}{2}\left[\frac{y}{\sqrt{x^2+4^2}}\right]$



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= [[ex cos(y-22)] + ][ex.-sin(y-22)
+ [ex.-sin(y-22).-2]
      = i [e' cos(y-2z)] + i [-e'sin(y-2z)+

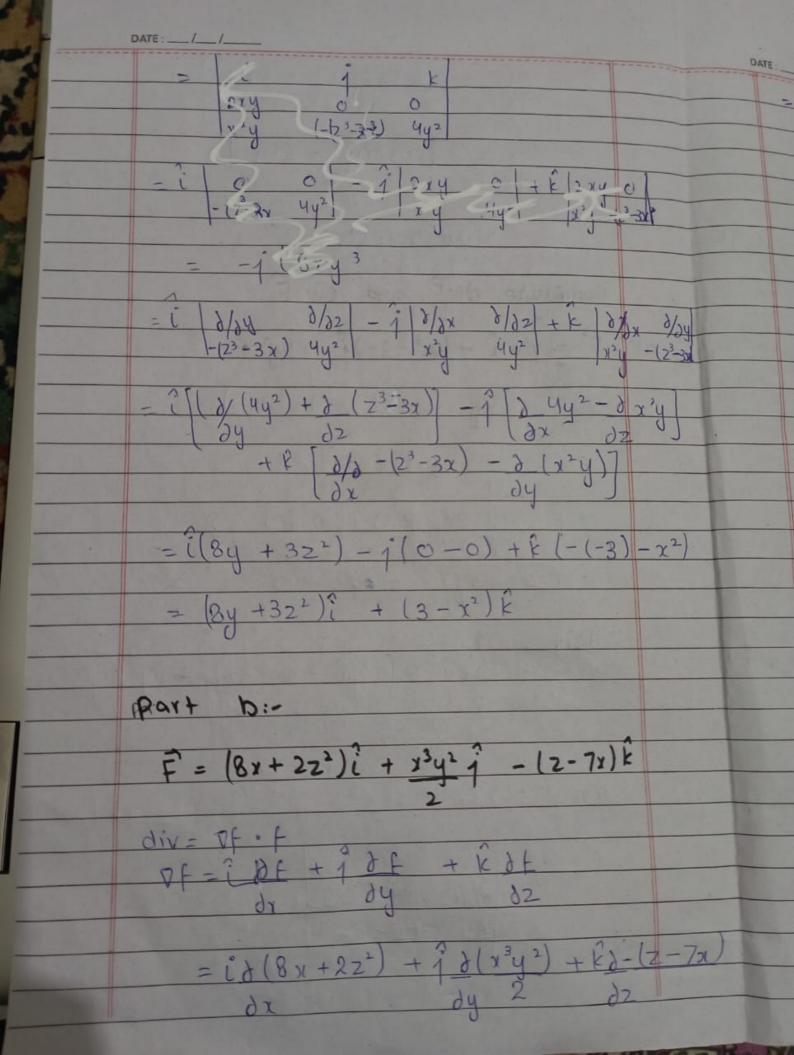
k [e' 2sin(y-2z)]
       ex[[ (cos(y-2z)) + [ -sin(y-2z)
                  + R (2sin(y-22)]]
    = e^{4} \cdot \left[ \hat{i} \left[ \cos \left( -2 - 2(0) \right) + \hat{j} \left( \sin \left( -2 - 2(0) \right) \right] + \hat{k} \left[ 2\sin \left( -2 - 2(0) \right) \right] \right]
   = 5.4.6 [i (cos(-2)] + i (sin(-2) + R (2sin(-1))
   = 5.46 [(12) + 1(-0.035) + R(-0.07)
= 554.62 - 1.9111 = -3.8 R
19 rand f1 = J(54-6)2 + (-1-911)2 + (-3-8)2
paradf = 54.8
The direction at which this rate of
change occur = 7 grad f
                54.6i - 1911 j - 3.8k
                     54.8
        - 54.62 - 1.911 2 - 3.8 R
54.8 54.8
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Question No: 07

a) $z = x^3 - \omega$, $x = t^3 + 7$ y = cos(at) . w = 4t dz = dz · dz · dy + dz · du

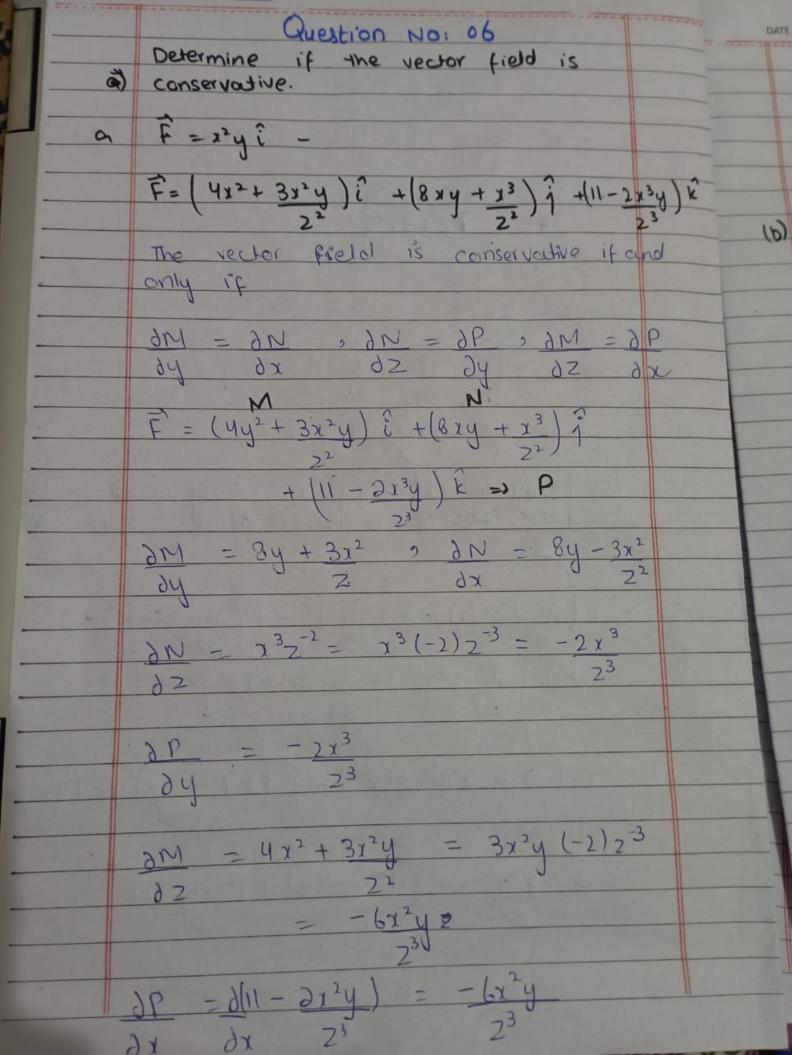
dt dz dt y dt dw dt Com $\frac{dl}{dt} = \frac{\partial x}{y^{4}}$ $\frac{\partial z}{\partial y} = \frac{(x^{2} - w)y^{-4}}{y^{4}}$ $\frac{\partial z}{\partial y} = \frac{(x^{2} - w) - 4y^{-5}}{y^{5}}$ $\frac{\partial z}{\partial y} = -4(x^{2} - w)$ $\frac{\partial z}{\partial y} = -4(x^{2} - w)$ dy - d cosat = -sinat. 2 dt dt = -2 sinat 82 - -1 dus = 4 $\frac{dz}{dt} = \frac{\partial z}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial z}{\partial y} \cdot \frac{dy}{dt} + \frac{\partial z}{\partial w} \cdot \frac{\partial w}{dt}$ $= \frac{\partial x^2}{\partial x^2} \cdot \frac{\partial x^2}{\partial t^2} + \left(-\frac{u}{x^2 - w}\right) \cdot -2 \sin 2t$ $= \frac{\partial x^2}{\partial y} \cdot \frac{\partial x^2}{\partial y} + \frac{\partial y}{\partial y} \cdot \frac{\partial y}{\partial y} \cdot \frac{\partial y}{\partial y} \cdot \frac{\partial y}{\partial y}$ = $6x^2t^2 + 8(x^2-w)\sin 2t - 4w$

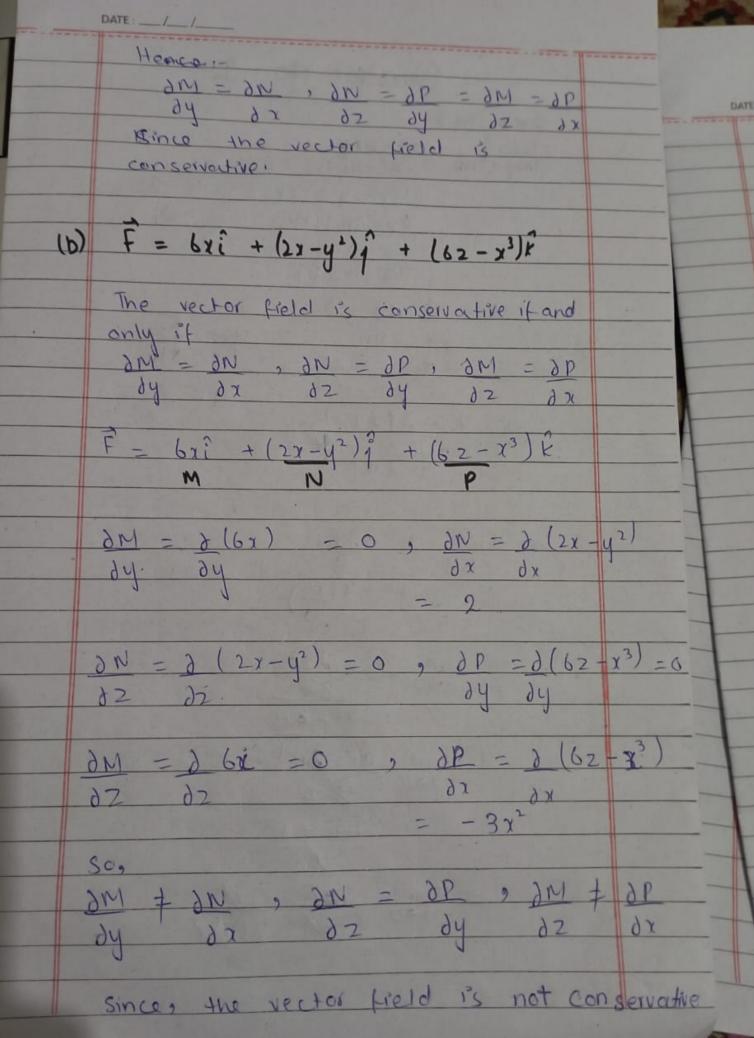
b) Z = x 3 y - 2 y , y = Sin(x2) $\frac{dz}{dz} = \frac{\partial z}{\partial y} \cdot \frac{\partial y}{\partial x}$ $\frac{\partial z}{\partial y} = \frac{\partial z}{\partial y} \cdot \frac{\partial z}{\partial y} - \frac{\partial z}{\partial y}$ $= \frac{(4x^2y^3 - 2)}{(4x^2y^3 - 2)}$ $\frac{dy}{dx} = \frac{-d \operatorname{SPn}(x^2)}{2x \cos x^2} = \frac{\cos x^2 \cdot 2x}{2x \cos x^2}$ $\frac{dy}{dx} \frac{dz}{dx} = \frac{\partial z}{\partial y} \frac{\partial y}{\partial x}$ $= \frac{(4x^2y^3 - 2)(2x\cos^2 x^2)}{8x^3y^3 \cos^2 x^2} \frac{\partial y}{\partial x^2} \frac{\partial y}{\partial x^2} \frac{\partial y}{\partial x^2} \frac{\partial y}{\partial x^2}$ part (c) compute dy for the following equation $\frac{x^2y^4-3}{differentiate} = \frac{\sin(xy)}{\sin(x^2y^4-3)} = \frac{d\sin(x^2y^4)}{dx}$ 2xy4+x24y30/y= 4 cos(xy) 2xy4 + 4x2y3 dy = 4cos(xy) 4x2y3 dy = 4cos(xy)-2xy4



 $= 8\hat{i} + x^3 \cdot 2y\hat{j} + -1\hat{k}$ $= 8\hat{i} + 2x^3y\hat{j} - \hat{k}$ $= 8\hat{i} + 2x^3y\hat{j} - \hat{k} \cdot (8x + 2z)\hat{i} + (x^3y^2)\hat{j} - (z - 7x)\hat{k}$ $= 2x^3y\hat{j} - \hat{k} \cdot (8x + 2z)\hat{i} + (x^3y^2)\hat{j} - (z - 7x)\hat{k}$ = 16x + 16z +2x6y4/2+ 2-7x $= i \left[\frac{\partial}{\partial z} - (z - 7x) - \frac{\partial}{\partial z} (x^3y^2) \right] - i \left[\frac{\partial}{\partial z} - (+z - 7x) - \frac{\partial}{\partial z} (3x + 2z^2) \right]$ $+ i \left[\frac{\partial}{\partial z} (x^3y^2) - \frac{\partial}{\partial z} (3x + 2z^2) \right]$ $= i \left[\frac{\partial}{\partial z} - (z - 7x) - \frac{\partial}{\partial z} (3x + 2z^2) \right]$ $= i \left[\frac{\partial}{\partial z} - (z - 7x) - \frac{\partial}{\partial z} (x^3y^2) - \frac{\partial}$ $= \frac{1}{1000} \left[\frac{1}{1000} - \frac{1}{1000} \right] - \frac{1}{1000} \left[\frac{1}{1000} - \frac{1}{1000} \right] + \frac{1}{1000} \left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} \right] + \frac{1}{1000} \left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} \right] + \frac{1}{1000} \left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} \right] + \frac{1}{1000} \left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} \right] + \frac{1}{1000} \left[\frac{1}{1000} + \frac{1}{1000} +$ $= i x^3y^2 - i (7 - 4z) + (3x^2y^2) k^7$

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Lim x-44 x,y >10,0) x-44 64+7x 64 = 7x 4 = 7x 15m x - 4(7x) $\frac{1}{190} \frac{x - 28x - \frac{1}{190} \frac{6x - 28x}{6}}{7x + 7x}$ = $\lim_{\chi \to 0} \frac{-2 \chi}{8(14 \chi)} = \lim_{\chi \to 0} \frac{-11 \chi}{42 \chi}$ Lim x2-y6
(x)y) = (0,0) xy3 1 1 mx (m3x3) $\frac{1}{x^{2}m^{3}} \frac{x^{4}(1-m^{6}x^{3})}{x^{2}m^{3}}$ $\frac{1-m^{6}x^{3}}{x^{2}m^{3}}$

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$$= (-1)^{3} - (4)e^{2}(0)$$

$$= (-1) + 0 - 3(4)$$

$$= -1-0 = +1$$

 $-6-12 +18$
 $= -1$

-18