

gr. Find the extreme values of function $f(x,y) = x^2 + y^3 - 3x - 12y + 20$.

Sd: - f(x,y) = x3+y3-3x-12y+20

 $f_x = 3x^2 - 3x$ & $f_y = 3y^2 - 12$

=> x2=1

2) x = 5

 $= \gamma = 6x$ $\Rightarrow s = 0$ $\Rightarrow t = 6y$

· For \((1,-2) := r = 6(1) = 6 & s = 0 & \(t = 6(-2) = -12 \)

or \(t - s^2 = 6(-12) - 0^2 = -72 \)

or \(t - s^2 < 0 \)

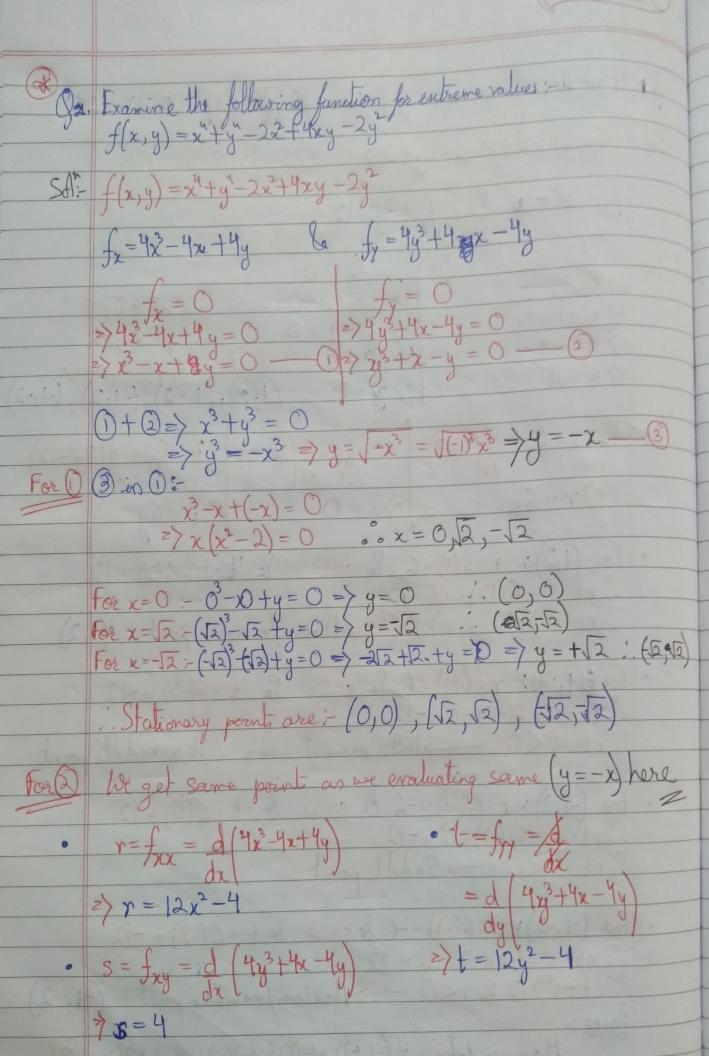
Neither maximal minima : It a saddle point

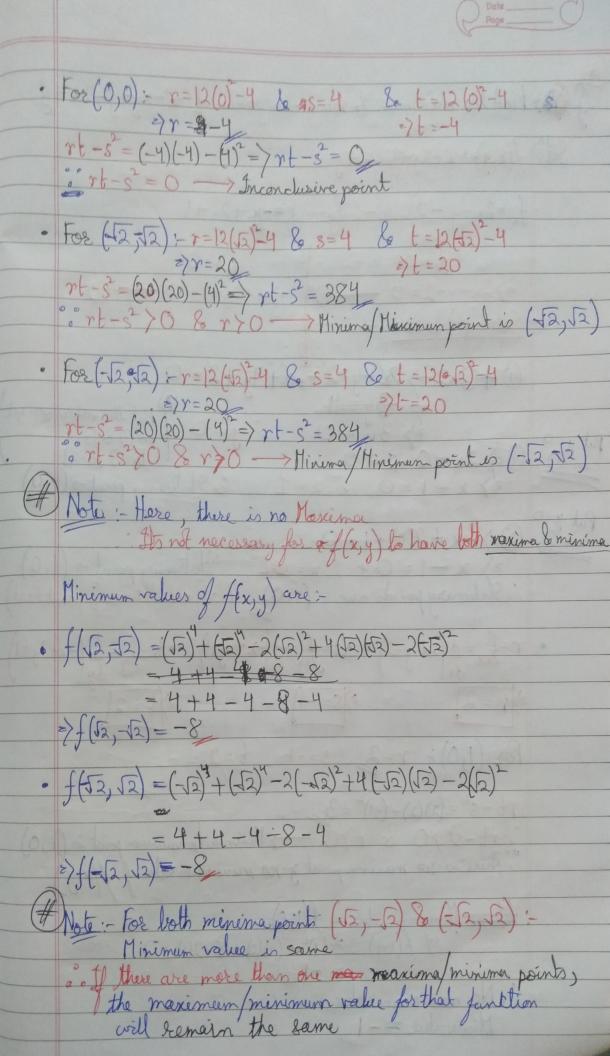
• For (-1,2): r=6(-1)=-6 be s=0 & t=6(2)=12• $rt-s^2<0$ \longrightarrow Saddle point

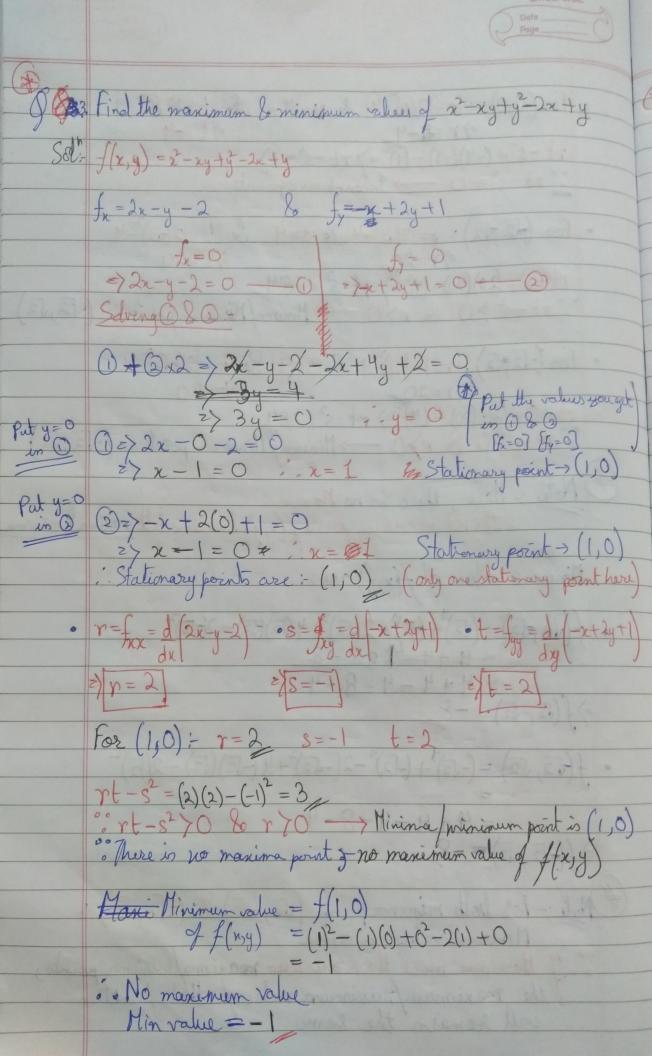
« For (-1,-2): r=6(-1)=-6 & s=0 & t=6(-2)=-12 « nt-s²=(-6)(-12)-0²=72 « nt-s²>0 & r<0 → Maxima/maximum point is (-1,-2) Hongo:-

Maximum frakue = $f(-1, -2) = (-1)^3 + (-2)^3 - 3(-1) - 12(-2) + 20 = 28$ Minimum value = $f(1, 2) = (1)^3 + (2)^3 - 3(1) - 12(2) + 20 = 2$

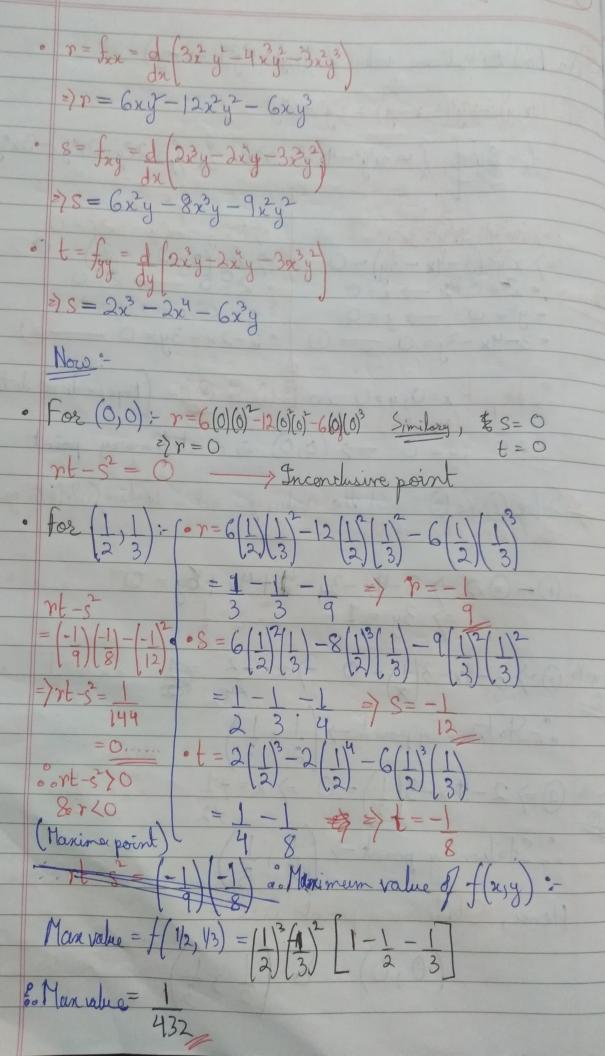
 $S = \int_{XY} = \frac{d(3x^2 - 12)}{dx(3x^2 - 12)} = \int_{XY} = \frac{d(3x^2 - 12)}{dx(3x^2 - 12)} = \int_{XY} = \frac{d(3x^2 - 12)}{dx(3x^2 - 12)}$

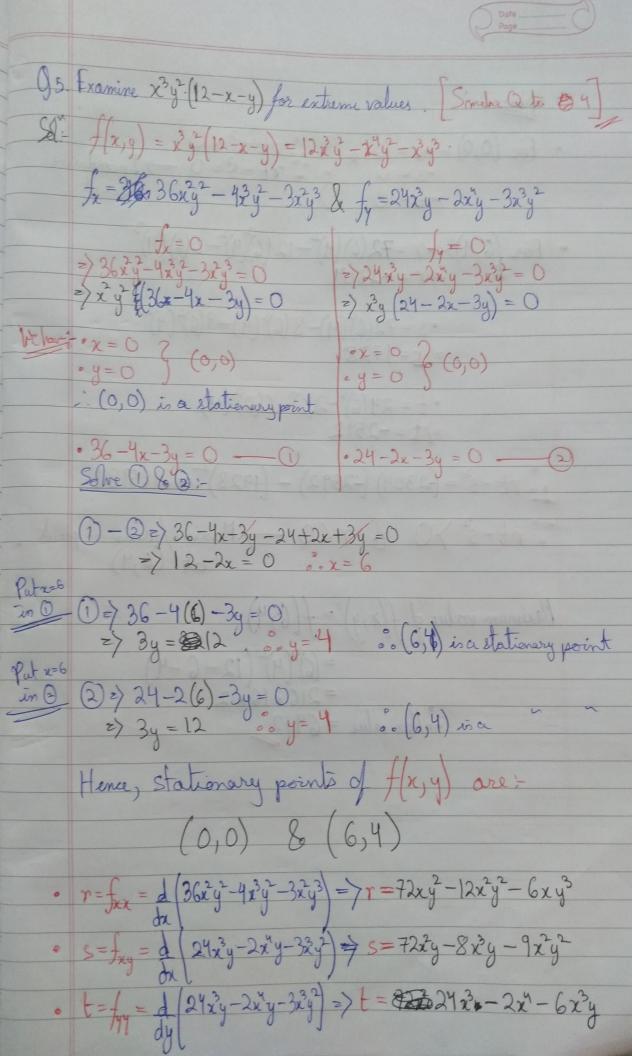






classmate gy. Find the extreme values of f(x,y) = x32 (1-x-y) $SI = - \{(x, y) = x^3y^2(1 - x - y) = x^3y^2 - x^4y^2 - x^3y^3$ $f_{x} = 3x^{2}y^{2} - 4x^{3}y^{2} - 3x^{2}y^{3} = 6x^{2}y - 2x^{2}y - 3x^{2}y^{2}$ => 3x2y2-4x3y2-3x2y3=0 => 2x3y-2xy-3x3y=0 $\frac{2}{x^2} + \frac{3}{3} - \frac{4}{x} - \frac{3}{3} = 0$ $\frac{2}{x^2} = 0 \Rightarrow x = 0$ $\frac{2}{y^2} = 0 \Rightarrow y = 0$ $\Rightarrow \chi^{3}y(2-2\chi-3y)=0$ $\Rightarrow \chi^{3}=0 \longrightarrow \chi^{3}=0$ y=0 -> y=0 3-4x-3y=0 · 2-2x-3y=0 - 2 (seperately) in & O & O = (Nope we do not do that) x=0, $y=0 \rightarrow (0,0)$ is a stationary point # Solve (1) & (2) and the value you get is wed in 6 & to get the same inerg stationary points $0 + 0 \times 2 = 3 - 4x - 3y - 4 + 4x + 8y = 0$ $2 \times 3y = 1$ Put y=13 (1) = 3-4x-3/1/=0 =) x=+2 = 3 in 0 = 5 fationary point > (1) 1 Pet y=1/3 (2) => 2-2x-3(1)=0 => x=+1 +2 es Stationary point -> (1 1) Hence, Stationary points are ; (0,0) 8 $(\frac{1}{2})\frac{1}{3}$





Now :-· For (0,0): - r= 0 & ? rt-s=0 -> Incordurare

os=0 -> rt-s=0 -> Incordurare

point - For (6,4):- 07 = 72(6)(4)^2-12(6)(4)^2-6(6)(4)^3 => 7=-2304 · S = 72(6)(4)-8(6)(4)-9(6)(4)= => S= 1728 · t = 24(6)3-2(6)-6(2)3(4) =>t=-2592 ort-3=(-2304)(-2592)-(1728)=2985984 ort-sto & r<0 -> Maxima/maximum point at (6,4) Maximum value of f(x,y) = f(6,4) = (6)3(4) (12-6-4) =216×16×2

.. . o Max value = 6912