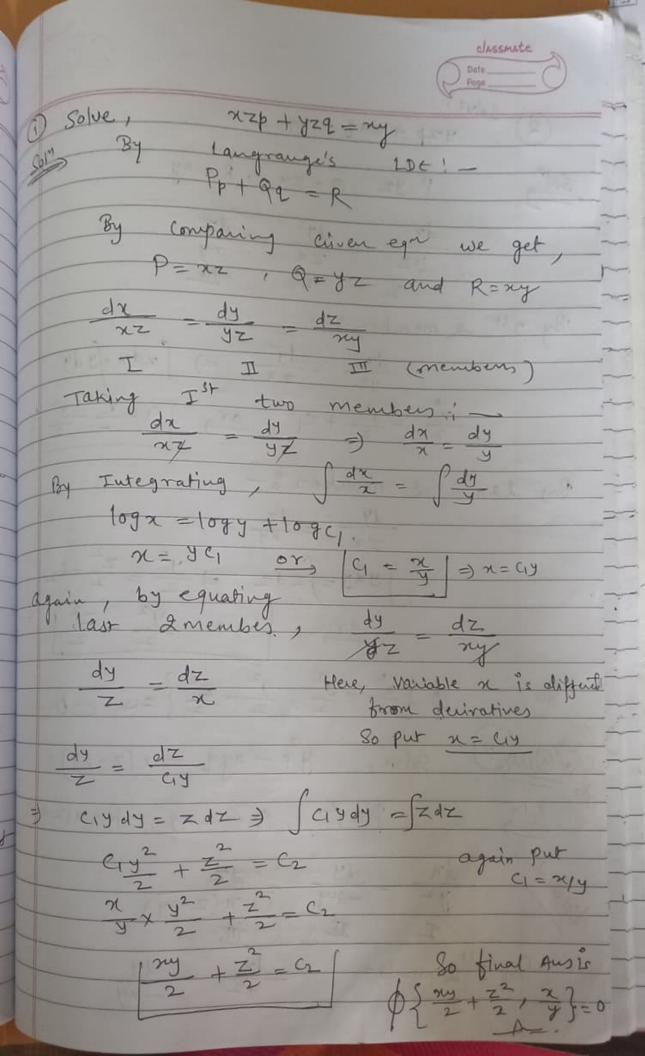
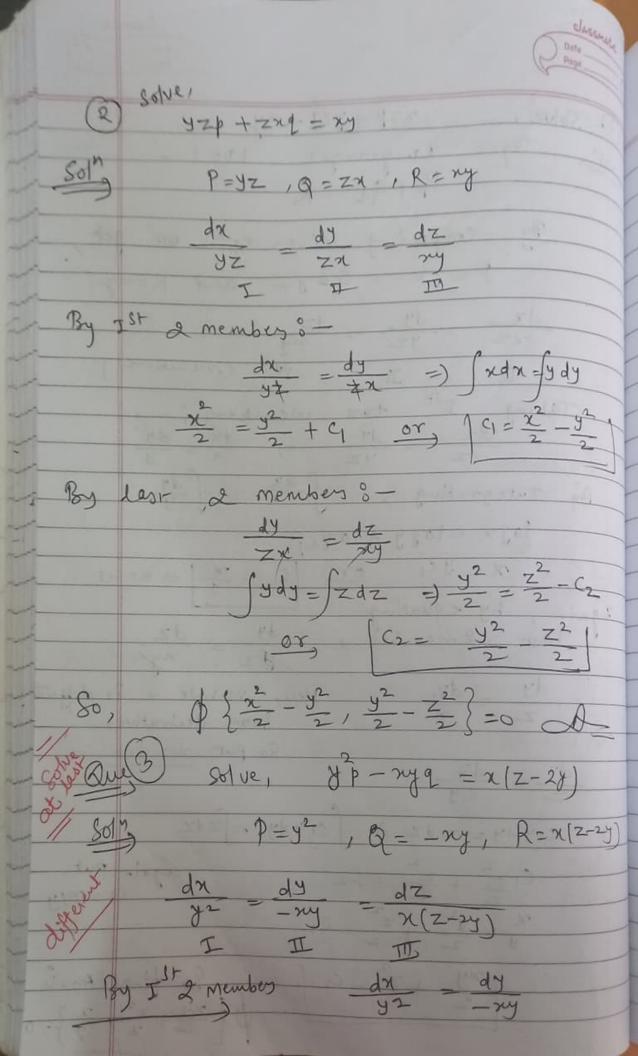
Langranges Lineau PDE. The PDE of the form,

Pr # 99 = R is the standard form

of Linear PDE of order one is

called "Langrange's LDE". Here, P, Q, R are any for of working Rule's To Solve Pp+Qq=R by Langrage's LDE: Step 0 Pp + 99 = R (Standard Asm) Step(2) dn dy dz Step 3) equate any 2 Independent terms each other and find



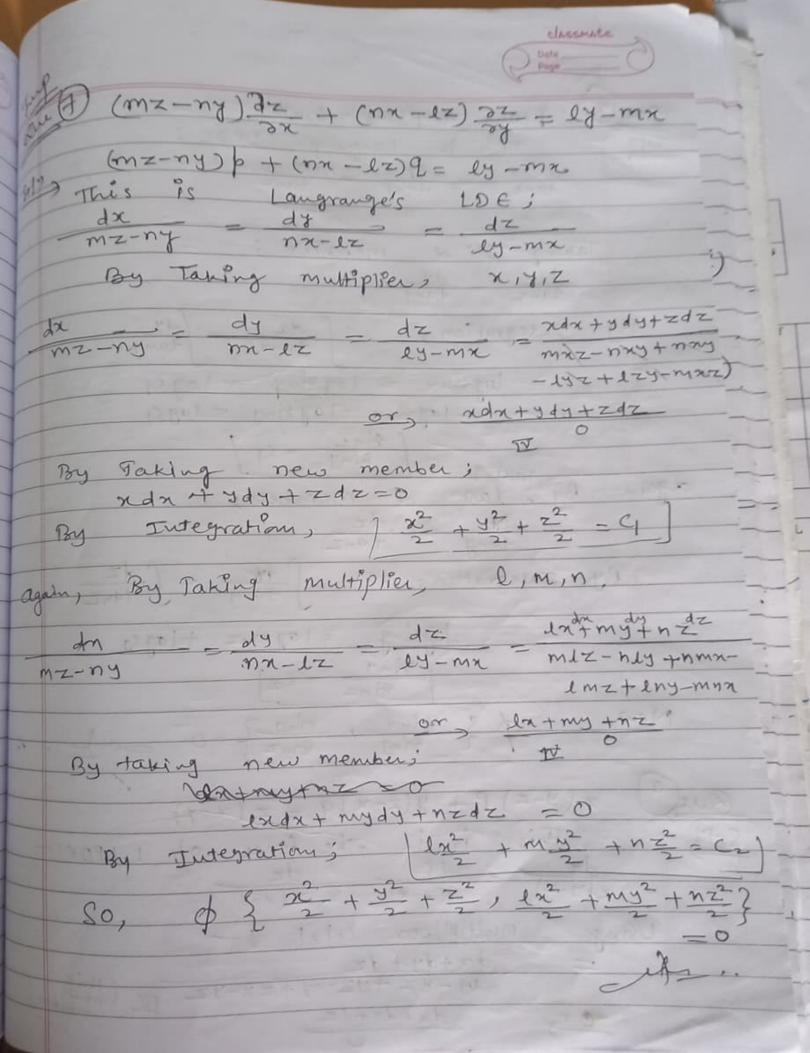


 $\frac{dx}{y} = \frac{dy}{-x}$ Tutegration; $-\int x dx = \int y dy$ $-\frac{x^2}{2} = \frac{y^2}{2} + \frac{x^2}{2} = (1)$ $\frac{y^2}{2} + \frac{x^2}{2} = (1)$ last & members; $\frac{dy}{-ydy} = \frac{dz}{x(z-2y)}$ (z-2y)dy = -ydz Zdy+ydz, - 2ydy =0 This is an exact Diffregn d (yz) - 2ydy=0 By Integration, 72 - 2 9 = C2 4z-y2=c2 0(4) Solve, xp+y29=z2 P=x2, Q=y2, R=z2 $\frac{dx}{x^2} = \frac{dy}{y^2} = \frac{dz}{z^2}$ By Ist 2 members; (dx = dy = y2 -1 -- y - c,

By last a member; $\frac{dy}{4^2} = \frac{dz}{\sqrt{z}}$ By Jutegration, Juz = Jidz Z2 - J = -1 - C2 So, 1 C2 = + - -80 (y+z-x2)p-2nyq+2zx=0 P=y+2-x2, Q=-2xy, P==2x7 $\frac{dy}{y^2+z^2-x^2} = \frac{dy}{-2xy} = \frac{dz}{2zx}$ (II) & (III): -- xyly = 22x (-dy = | dz -logy = logz & log() log c1 = log z + log y 50, (1=42) Nas It is difficult to find another Answer, so we will solve such that

Using x, y, z as multipliers, each fraction Again, D and we make a new member; | dx | = dz | = 22x m It is difficult to calculate & find Soly, so we multiply スタス ナゴ カリナ て タア - xy2 - xz2 - x3 IV (This is new member) dow By equating IT the member with I or II. when $\frac{\chi}{2}$ $\frac{\chi}{2}$ By Integ" 109 (x2+y2+z2)==logz+logcz So, $\phi \{ \frac{1}{2}, \frac{1}{2}(x^2+y^2+z^2) = c_2$ DSolve, x2 (y-z) P+y2 (z-x) 2= z2 (x-y) Criven equ'is in the form of Languages 80, $\frac{dx}{x^2(y-z)} = \frac{dy}{y^2(z-x)} = \frac{dz}{z^2(x-y)} = 0$ By Taking multiplier System; 1/21 /42 /1/2 multiply in each fraction of and form a new member such that 0 da

 $\frac{dx}{x^2(y-z)} = \frac{dy}{y^2(z-x)} = \frac{dz}{z^2(x-y)}$ 1 dx + 1/2 dy + 1/2 dz y-z+z-x+x-y or 1 dx+1 dy+1 z2dz By Taking new mender; 12 dn + y2dy + 12dz = 0 By Integration, -\frac{1}{\pi} - \frac{1}{2} = C_1 or > / 2+ + + = - G Taking another multipliers 21 & 1/2 $\frac{dx}{x^{2}(y-z)} = \frac{dy}{y^{2}(z-x)} = \frac{dz}{z^{2}(x-y)} = \frac{1}{x(y-z)+y(z-y)+z(x-y)}$ IT or, 1xdx+ydy+2dz By Taking new member; 1 dx + 1 dy + 2 dz =0 By Integration, logx+logy+logz= log62 247 = C2

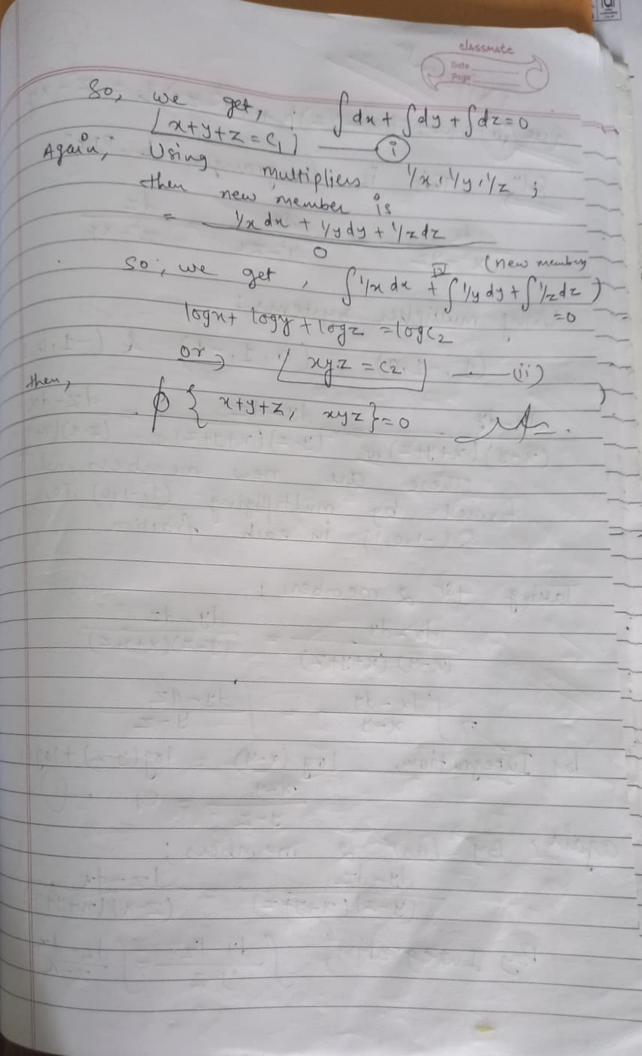


plane + plany = tanz This is Langrange's LPDG;

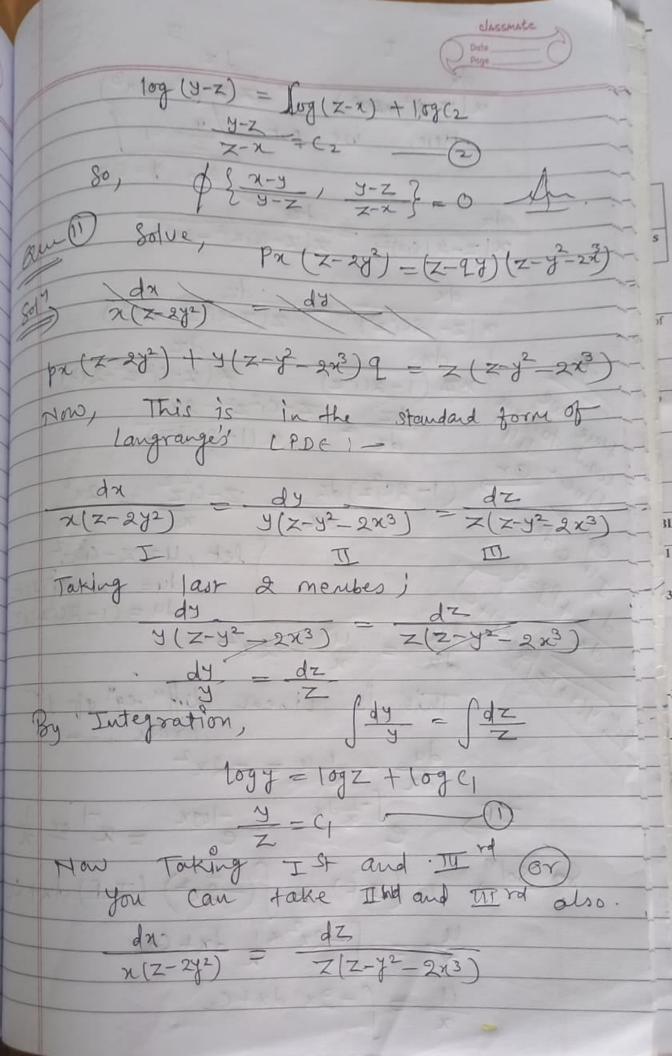
dx dy dz

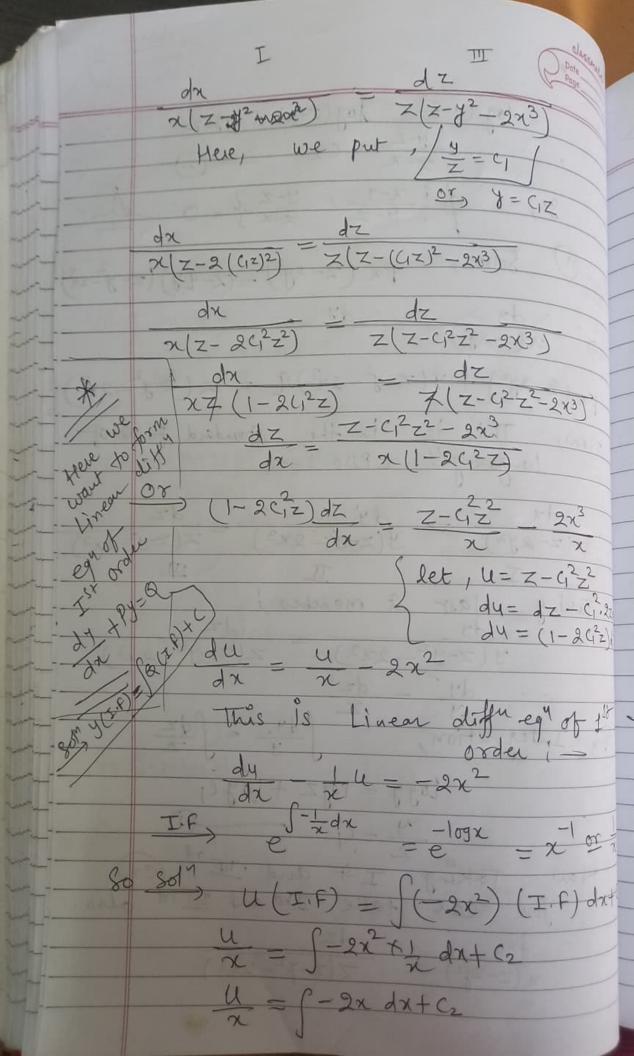
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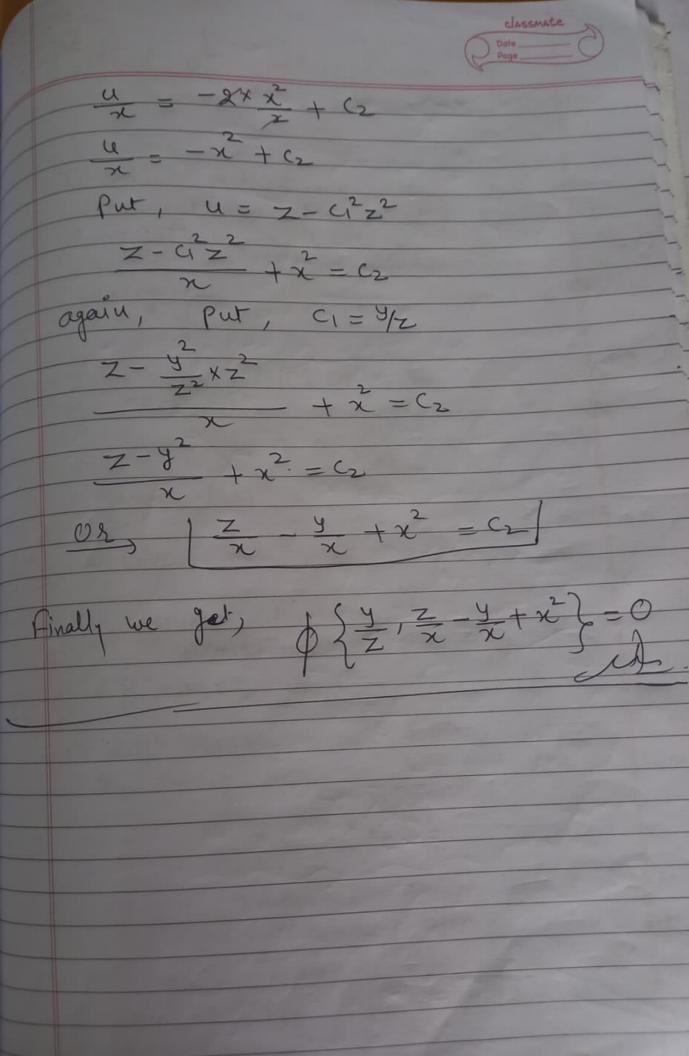
T Taking 1st 2 members i dx = dy tany By Integration; dx dy tany logina = log sing + log (Taking Siny = C1 By last 2 members; Tany = Janz By Integration; loginy = loginz + logi 8inz = C2 \$ { 8ing, 8inz} =0 2(y-z) P+y(z-x) 9=z(x-y) This is in the form of L.LPDE! $\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{x(x-y)}$ Using multipliers 1,1,1 カスナインナイン スツーハンナンスーツン IV (から) ant dy+dz



Que (10) solve, (x2-yz)\$ + (y2-zx) 2 = z2-xy Soly This is Langranges L. PDE" $\frac{dx}{x^2-yz} = \frac{dy}{y^2-zx} = \frac{dz}{z^2-xy}$ Using multiplier Systems; (1,-1,0), (0,1,-1) & (-1,0,1)dx-dy = dy-dz = dz-dx (x-y)(x+y+z) = (y-z)(x+y+z) = (z-x)(x+y+z)formed by multiplying (1,-1,0), (0,1,1-1) & (-1,0,1) in each fraction Taking yer & members; 1x-y) (x+y+x) = (y-z)(x+y+x) $\int dx - dy = \int dy - dz$ y - zBy Integration, log(x-y) = log(y-z) + log() again, By last 2 members; $\frac{dy-dz}{(y-z)(x+y+z)} = \frac{dz-dx}{(z-x)(x+y+z)}$ By Integration, Sdy-dz = Sdz-dn y-z = Sdz-dn







Method of Separation of me In this method, we assume that the dependent variable is the product of 2 functions, each of which Involves only one of the independent variables. As a Consequence, 2 ordinary differential egs are formed. Solve the diff equ , by Using method of Separation of variable.

The separation of variable. given that, $u(x,0) = 6e^{-3x}$ Soly Given, 34 - 234 +4 ----i) receight Assume: that the trial solm of (i) is with a sold of (i) is with a sold of with a with a sold of the trial sold of (i) is the sold of the trial sold of (i) is the sold of the trial sold of (i) is By putting values of (ii), (iii) and (iv) in equ() X'T = 2 XT + XT X'T-XT = 2XT T(X'-X) = 2XT' X'-X = 2T' = K (let)By equating I and (III):-

X-X = K integrating wirt x -1=K Jx - fdx = fkdx 109x - x = Kx + 1099 logx = Kx+n +logc 109 x = x(K+1) + 1094 So, x = (k+1)x $\Rightarrow x = c_1 e^{(k+1)x}$ again, (I) and III: -2T = K integrating wort. 20gt 2 T = JKdt 2 | ogT = Kt + 1 ogC2 | logTe = Kt + 10gC2 So, I = ext/2 => T= (3e KH2

By putting the values of (V) (Wi) in / U= G(3e(K+1)x, ext/2 By Putting juited conditions; $u(x,0) = 6e^{-3x}$ By purious in(vi) $6e^{-3x} = (K+1)x$ $6e^{-3x} = (K+1)x$

