

Practice Problems:

1. Determine the partial differential equation of all spheres of fixed radius having their centers in xy – plane.
2. Form the partial differential equation by eliminating the arbitrary constants a and b from $(x - a)^2 + (y - b)^2 = z^2 \cot^2 \alpha$.
3. Form the partial differential equation by eliminating the arbitrary constants a and b from $z = a^2x + ay^2 + b$.
4. Form the partial differential equation by eliminating the arbitrary constants a and b from $z = ax^n + by^n$.
5. Find the partial differential equation of all planes cutting equal intercepts from the x and y axes.
6. Find the partial differential equation of all planes passing through the origin.
7. Find the PDE of all planes which are at a constant distance k from the origin.
8. Find the partial differential equation of the family of spheres having their centres on the line $x = y = z$.
9. Form the partial differential equation by eliminating the arbitrary functions from $z = f(x)g(y)$.
10. Form the partial differential equation by eliminating the arbitrary functions from $z = xy + f(x^2 - y^2)$.

11. Form the partial differential equation by eliminating the arbitrary functions from $z = y^2 + 2f\left(\frac{1}{x} + \ln y\right)$.
12. Form the partial differential equation by eliminating the arbitrary functions from $z^2 - xy - f\left(\frac{x}{z}\right) = 0$.
13. Form the partial differential equation by eliminating the arbitrary functions from $x^2 + y^2 + z^2 = f(x + y + z)$.