Answer the following: (any two)

1. Write Lagrange’s auxiliary equation of 
   \[ z(2^2 - xy)(px - qy) = x^4. \]
2. Eliminate the arbitrary constants \( a \) and \( b \) from 
   \[ z = (x^2 + a)(y^2 + b). \]
3. Obtain complete integral of \( p + q = pq \).
4. Eliminate the arbitrary function \( F \) from \( z = F(x^2 + y^2) \).
5. Find complementary function of \( (D^2 - 7DD' + 6D'^2)z = 0 \).
6. Find \( \frac{1}{(D - D')} e^{x+y} \).
7. Solve: \( (D + 3D' - 2)z = 0 \).
8. Find particular integral of \( \frac{\partial^2 z}{\partial x^2} \frac{\partial^2 z}{\partial y^2} = \cos x \cdot \cos xy \).
Answer the following: (any two)  

1. Obtain the partial differential equation by eliminating arbitrary constants a, b and c from

\[ \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 10 \]

2. Solve:

\[ \frac{dx}{x(y^2+z)} = \frac{dy}{y(x^2+z)} = \frac{dz}{z(x^2-yz)} \]

3. Solve:

\[ x(y^n-z^n) p + y(z^n-x^n) q = z(x^n-y^n) \]

4. Obtain the partial differential equation by eliminating arbitrary function \( \phi \) from:

\[ lx + my + nz = \phi(x^2 + y^2 + z^2) \]

Answer the following: (any two)  

1. Explain the method to solve

\[ F(p, q) = 0. \]

2. Solve:

\[ z^2(p^2 + q^2 + 1) = c^2 \]

3. Solve:

\[ p^2 + q^2 = x + y \]

4. Solve:

\[ 9(p^2 z + q^2) = 4 \]

Answer the following: (any two)  

1. In usual notations, prove that:

\[ \frac{1}{f(D, D')} e^{ax+by} = \frac{1}{f(a, b)} e^{ax+by} \cdot f(a, b) \neq 0 \]

where \( f(D, D') = D^2 + K_1 DD' + K_2 D'^2 \)

If \( f(a, b) = 0 \) then what can you say about particular integral?
(2) Solve :
\[ r - 45 + 4t = e^{2x+y} \]

(3) Solve :
\[ \frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = x^2y \]

(4) Solve :
\[ \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6 \frac{\partial^2 z}{\partial y^2} = y \cdot \cos x \]

5 Answer the following: (any two) 10

(1) Obtain Monge’s equations for
\[ y^2r - 2ys + t = p + 6y \]

(2) Solve :
\[ (D^2 + 2DD' + D'^2 - 2D - 2D')2 = \sin(x + 2y) \]

(3) Solve :
\[ (D - D' - 1)(D + 2D' - 3)z = 4 + 3x + 6y \]

(4) Solve :
\[ (D^2 - DD' + D' - 1)z = \cos(x + 2y) \]