Partial Differential Equations

1.

Use the method of characteristics to solve:

$$x e^{-u} = 0,$$ given $u = 2$ when $y = x^2$.

2.

$$x u g + y u_y e / (x - y)$$ when $x + y = 1$.

3.

$$2 x y u + (x^2 + y^2) u_y = 0$$ given $u = 0$ and given $u = \cos x$ when $x^2 + y^2 = 1$.

4.

$$y u_x + x u_y = 2 u$$ given $u(x, 1) = g(x)$.

5.

$$x u g + y u_y.$$