

Answer on Question #82974 – Math –Differential Equations

Question

Solve this IVP $U_{xx}=4xy+e^x, u(0,y), U_x(0,y)=1$

Solution

$$U_x = \int U_{xx} dx = \int (4xy + e^x) dx = \int 4xy dx + \int e^x dx = 4y \frac{x^2}{2} + e^x + c$$

$$U_x(0, y) = 4y \frac{0^2}{2} + e^0 + c = 1 + c = 1 \Rightarrow$$

$$c = 0$$

$$U = \int U_x dx = \int \left(4y \frac{x^2}{2} + e^x \right) dx = \int 4y \frac{x^2}{2} dx + \int e^x dx = 2y \frac{x^3}{3} + e^x + c$$

$$U(0, y) = 2y \frac{0^3}{3} + e^0 + c = 1 + c$$

If $U(0, y) = 1$, then

$$U(0, y) = 2y \frac{0^3}{3} + e^0 + c = 1 + c = 1 \Rightarrow$$

$$c = 0$$

$$\Rightarrow U = 2y \frac{x^3}{3} + e^x$$

Answer:

$$U(0, y) = 1 + c$$

If $U(0, y) = 1$, then

$$U = 2y \frac{x^3}{3} + e^x.$$