

MTH 352/652

Quiz #1

1. Find a function $u(t, x)$ that satisfies the PDE

$$u_x = u$$

subject to the boundary condition $u(t, 1) = 1$.

$$\begin{aligned}\frac{\partial u}{\partial x} &= u \\ \Rightarrow \ln(|u|) &= x + g(t) \\ \Rightarrow u &= e^{g(t)} e^x \\ \Rightarrow u &= g(t) e^x\end{aligned}$$

Therefore,

$$\begin{aligned}u(t, 1) &= g(t) e = 1 \\ \Rightarrow g(t) &= \frac{1}{e} \\ \Rightarrow u(t, x) &= e^{x-1}.\end{aligned}$$