Quiz 2 **Name:** _____

MATH 3150, Section 004 January 25, 2017

For all the following multiple-choice questions, circle your answers clearly. No partial credit will be awarded; any scratch work will be ignored.

1. Consider the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ (along with some boundary conditions). The function $u(x)$ that satisfies the heat equation after setting $\frac{\partial u}{\partial t} = 0$ is

(a) the unique solution

(b) the homogeneous solution

(c) the equilibrium or steady-state solution

(d) the Dirichlet/Neumann solution

(e) the trivial solution

2. Given an operator $L(\cdot)$ and a known function $f(x,t)$, then suppose that $L(u) = f$ is a linear and homogeneous PDE for the unknown u. Which of the following is true?

(a) The unique solution to the PDE is $u(x,t) = \exp(-t)\cos x$.

(b) For any L and f, the *only* solution is the trivial solution $L(u) = 0$.

(c) It must be true that $f(x,t) = \exp(x+t)$

(d) If u_1 and u_2 individually solve the PDE, the $u_1 + u_2$ also solves the PDE.

(e) It must be true that $L(u) = \frac{\partial u}{\partial t} - k\frac{\partial^2 u}{\partial x^2}$

3. Which of the following PDEs is linear and homogeneous?

(a) $\frac{\partial}{\partial t}(u^2) = \sin(x)$

(b) $\frac{\partial u}{\partial t} = 3\frac{\partial^2 u}{\partial x^2}$

(c) $u\frac{\partial u}{\partial x} = 0$

(d) $\sin u + \frac{\partial u}{\partial x} = 0$

(e) $\frac{\partial u}{\partial t} + \frac{1}{2}\frac{\partial}{\partial x}(u^2) = 0$