Quiz 3 **Name:** ______________________________
MATH 3150, Section 004 February 1, 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. Which of the following is an appropriate "guess" for the solution $u(x,t)$ that one uses in the first step of the method of separation of variables?

(a) $u(x,t) = T(t)$

(b) $u(x,t) = 0$

(c) $u(x,t) = \phi(x)T(t)$

(d) $u(x,t) = G(x)$

2. We have seen an integral condition of the form

$$\int_0^L \sin\left(\frac{n\pi x}{L}\right)\sin\left(\frac{m\pi x}{L}\right) \mathrm{d}x = \begin{cases} 0, & m \neq n \\ L/2, & m = n \end{cases}$$

What is the mathematical name given to a relation of this form?

(a) Separation of variables

(b) An orthogonality condition

(c) The equilibrium or steady-state solution

(d) An ordinary differential equation

3. Consider the ordinary differential equation (ODE) for $\phi(x)$ for $0 < x < L$:

$$\phi''(x) + \lambda\phi(x) = 0, \qquad \phi(0) = 0, \quad \phi(L) = 0,$$

where λ is a scalar. Suppose we find a particular λ that is an *eigenvalue* and a corresponding ϕ that is an *eigenfunction*. What does this mean?

(a) $\phi(x)$ is the unique solution to the ODE

(b) $\phi(x) \neq 0$ is a solution to the ODE for the given λ

(c) $\phi(x) = 0$ is a solution to the ODE with $\lambda \neq 0$.

(d) $\lambda = 0$

(e) $\lambda = 0$ and $\phi(x) = 0$