

Multiple-Choice Test

Chapter 10.01

Introduction to Partial Differential Equations

1. A partial differential equation requires
 - (A) exactly one independent variable
 - (B) two or more independent variables
 - (C) more than one dependent variable
 - (D) equal number of dependent and independent variables
2. Using substitution, which of the following equations are solutions to the partial differential equation?

$$\frac{\partial^2 u}{\partial x^2} = 9 \frac{\partial^2 u}{\partial y^2}$$

- (A) $\cos(3x - y)$
 - (B) $x^2 + y^2$
 - (C) $\sin(3x - 3y)$
 - (D) $e^{-3x} \sin(\pi y)$
3. The partial differential equation

$$5 \frac{\partial^2 z}{\partial x^2} + 6 \frac{\partial^2 z}{\partial y^2} = xy$$

is classified as

- (A) elliptic
 - (B) parabolic
 - (C) hyperbolic
 - (D) none of the above
4. The partial differential equation

$$xy \frac{\partial z}{\partial x} = 5 \frac{\partial^2 z}{\partial y^2}$$

is classified as

- (A) elliptic
- (B) parabolic
- (C) hyperbolic
- (D) none of the above

5. The partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial y^2} = 0$$

is classified as

- (A) elliptic
 - (B) parabolic
 - (C) hyperbolic
 - (D) none of the above
6. The following is true for the following partial differential equation used in nonlinear mechanics known as the Korteweg-de Vries equation.

$$\frac{\partial w}{\partial t} + \frac{\partial^3 w}{\partial x^3} - 6w \frac{\partial w}{\partial x} = 0$$

- (A) linear; 3rd order
- (B) nonlinear; 3rd order
- (C) linear; 1st order
- (D) nonlinear; 1st order