

## Worksheet: Basics of Differential Equations

This worksheet has questions on the classification of, and solutions to, differential equations. Before attempting the questions below, you could read the study guide: [Basics of Differential Equations](#).

Basics of  
Differential  
Equations  
study guide



Model Answers  
to this worksheet



1. Are the following differential equations first order or second order?

a.  $\frac{dy}{dx} + y = 0$

b.  $y' + 6xy = 0$

c.  $\frac{d^2y}{dx^2} = 3x^2y$

d.  $y'' + y' - 4 = 0$

e.  $\left(\frac{dy}{dx}\right)^2 = 3x^2y$

f.  $\frac{\partial z}{\partial x} - 3x^2y = x$

2. What type of differential equations are these?

a.  $\frac{dy}{dx} + 3y = 0$

b.  $\frac{\partial z}{\partial x} + 3xz = 0$

c.  $y'' - y'y = 0$

d.  $\frac{\partial^2 u}{\partial x^2} + \frac{dv}{dt} = 0$

e.  $x(y')^2 + y = 3x$

f.  $y'' + 3y' = \cos(y)$

(You should state whether they are: **partial** or **ordinary**, **first order** or **second order**, **linear** or **nonlinear**.)

3. You are given the second order ordinary differential equation:  $y'' + 4y' + 3y = 0$ .

First, substitute  $y = e^{-x}$  into the differential equation and then substitute  $y = e^{-3x}$  into the differential equation, and explain why both are solutions.

4. Given the second order ordinary differential equation  $y'' + y' - y = 0$ , substitute  $y = e^{-2x}$  into the differential equation and explain why it is **not** a solution.



This worksheet is one of a series on mathematics produced by the **Learning Enhancement Team**.

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