

Show all work. Your answers must be fully justified.

1. For each differential equation, circle linear or non-linear as appropriate and determine the order.

(a) $9\frac{d^3y}{dt^3}y^2 - 3yt = 4t^7 + 2t$ linear / non-linear order:

(b) $2\frac{d^2y}{dt^2}t^5 - 4yt = 5y + 2$ linear / non-linear order:

2. Verify that $y = (\sin t)^2$ is a solution to

$$y'' = 2 - 4y$$

(It may be helpful to recall the Pythagorean Identity: $(\cos t)^2 + (\sin t)^2 = 1$)

3. Find the general solution to

$$y' - 2y = 3e^t$$