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Math. 415 - Quiz 1

PROBLEM 1 (10 points)

$$u_t = -\frac{x^2}{2} u_{xx} \quad (1)$$

- (i) Determine the order of (1)
- (ii) State whether (1) is linear or nonlinear
- (iii) Verify that $u = x^2 e^{-t}$ is a solution of (1).

(i) u_t is 1st order derivative
 u_{xx} is 2nd order derivative
The highest order derivative is 2nd order, so (1) is 2nd order

(ii) linear

(iii) Let $u = x^2 e^{-t}$

$$\text{then } u_t = -x^2 e^{-t}$$

$$u_x = 2x e^{-t}$$

$$u_{xx} = 2 e^{-t}$$

$$\text{So } u_t = -\frac{x^2}{2} u_{xx}$$

Therefore this given function is
a solution of (1)