MTH0210 DIFFERENTIAL EQUATIONS
MIDTERM ASSIGNMENT QUESTIONS

Please show all your work. For each differential equation you solve, please write the type of the equation first.

1. Solve the initial value problem

$$\frac{d^2y}{dx^2} + y = \cos x,$$

$$y(0) = 2,\ y'(0) = 1.$$

2. Solve the differential equation

$$9(\sin t \frac{dy}{dt} + y \cos t) = (\sin t)^3 \cos t$$

3. Solve the differential equation

$$\frac{dy}{dt} + \frac{t+1}{2t} y = \frac{t+1}{yt}.$$

4. Evaluate the solution of

$$\left(\sqrt{x+y} - \sqrt{x-y}\right) dx + \left(\sqrt{x-y} - \sqrt{x+y}\right) dy = 0.$$

5. An amount of money is invested in a continuously compounded interest account. The amount of money increases at a rate proportional to the amount present. Suppose 10000 TL is invested where the annual interest rate is 12%.

a. How much money will be present after 10 years?

b. How long will it take the invested money to double?

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