

The University of Jordan

Mathematics Department

Math 202 / First Exam

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د. بنان عسايه

Name: Student Number: 46 Section: (11-12)

(1) Solve the initial value problem: $xy' = y + xe^{y/x}$, $y(1) = 0$.

$$x \frac{dy}{dx} = y + xe^{y/x}$$

$$xy' - y = xe^{y/x}$$

$$\frac{dy}{dx} = e^{y/x} + \frac{y}{x}$$

$$= e^{y/x} + \frac{y}{x}$$

$$= e^{y/x} + \frac{y}{x}$$

Homogeneous

$$\text{Let } y = vx \Rightarrow v = \frac{y}{x}$$

$$y' = v + vx'$$

$$v'x + v = e^v + \frac{vx}{x}$$

$$v'x + v = e^v + v$$

$$\frac{dv}{dx} x = e^v$$

$$dv \cdot x = e^v dx$$

$$\int e^{-v} dv = \int \frac{1}{x} dx$$

$$-e^{-v} = \ln|x| + c$$

$$-\frac{y}{x} = \ln|x| + c$$

$$-\frac{0}{1} = \ln|1| + c$$

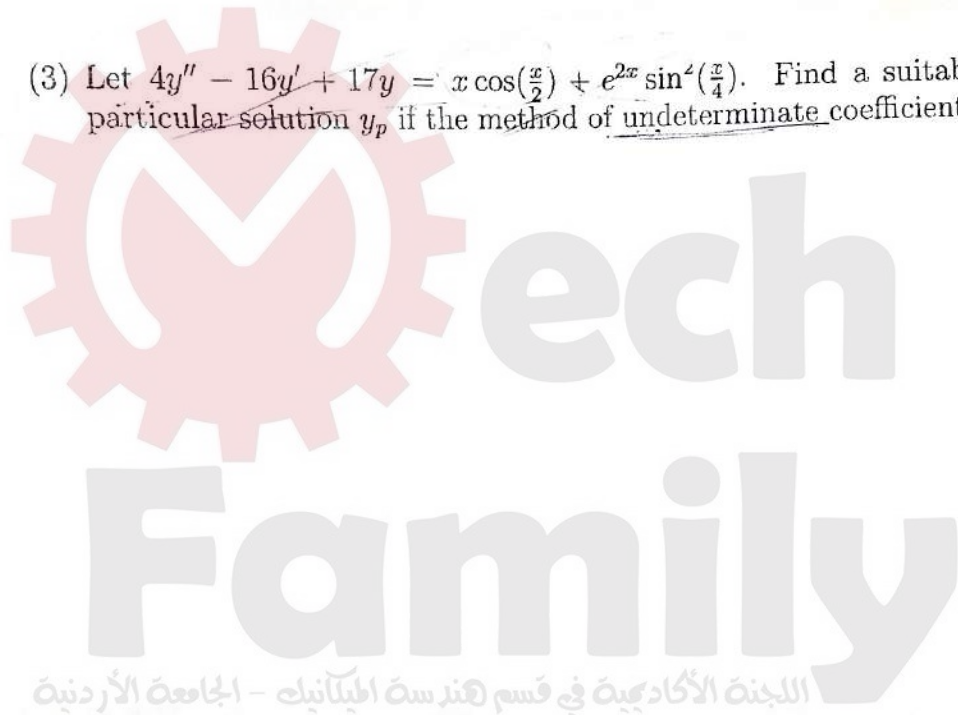
$$c = -1$$

$$-\frac{y}{x} = \ln|x| - 1$$

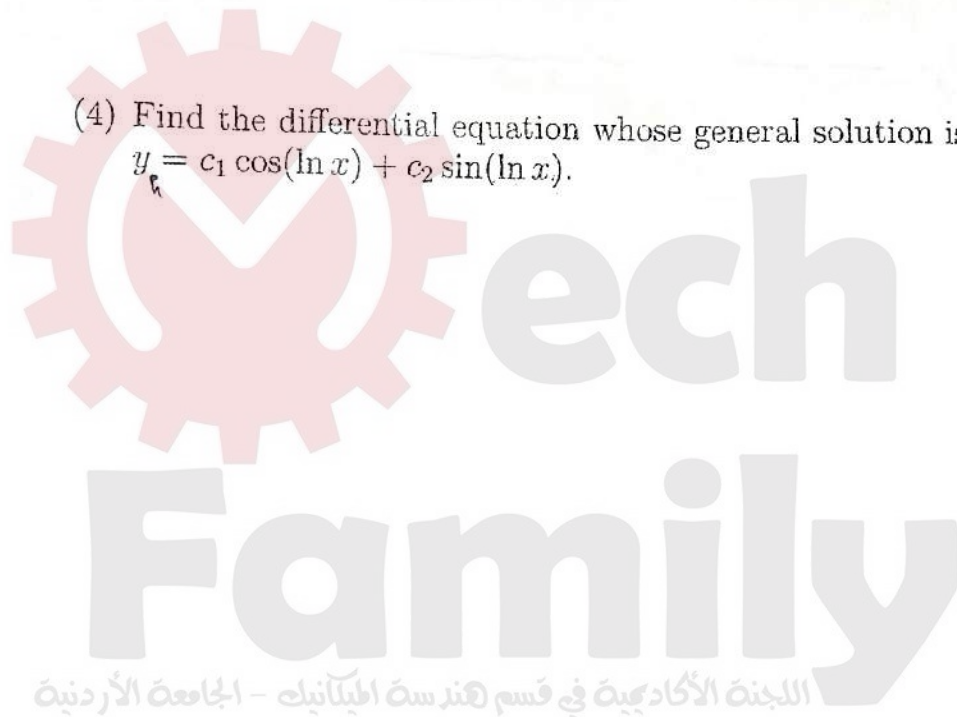
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- (2) Find the general solution of the given differential equation:
 $2y^2y'' + 2y(y')^2 = 1.$

- (3) Let $4y'' - 16y' + 17y = x \cos(\frac{x}{2}) + e^{2x} \sin^2(\frac{x}{4})$. Find a suitable form of the particular solution y_p if the method of undeterminate coefficients is to be used.



(4) Find the differential equation whose general solution is given by
 $y = c_1 \cos(\ln x) + c_2 \sin(\ln x).$



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(5) Solve the differential equation:

$$y'' + 4y' + xy = e^{-2x} \ln x + y(x - 4).$$

