

Math 2310H, Diff Eq Problems, Fall 2002

This sheet has sample problems in separable, linear first order, homogeneous first order (the kind where $u = y/x$ is the substitution you want to do), and second order linear homogeneous differential equations with constant coefficients.

Questions (Solve the following differential equations!)

1. $\frac{dy}{dx} = \frac{x^2}{y}$.

2. $y'' - y' - 6y = 0$.

3. $\frac{dy}{dx} = \frac{x + 3y}{x - y}$.

4. $y' = \cos^2(x) \cos^2(2y)$.

5. $y' + y^2 \sin(x) = 0$.

6. Solve two ways: $2y - x \frac{dy}{dx} = 0$.

7. $y'' - y = 0$.

8. $\frac{dy}{dx} = \frac{x + y}{x}$.

Solutions

1. $3y^2 - 3x^3 = C$.

2. $y = C_1 e^{-2x} + C_2 e^{3x}$.

3. $-\frac{2x}{x + y} = \ln(C(x + y))$.

4. $2 \tan(2y) - 2x - \sin(2x) = C$.

5. $y^{-1} + \cos(x) = 0$.

6. $y = Cx^2$.

7. $y = C_1 e^x + C_2 e^{-x}$.

8. $y = Cx + x \ln(x)$.