Math 5231 - Fall 2018
Problem Set 2

Integrating Factors Use integrating factors to solve the following for their general solution. What is the domain of the solution?

1) $\dfrac{dy}{dx} - 4y = e^{5x}$

2) $\dfrac{dy}{dx} = x^2 - 3x^2 y$

3) $t\dfrac{dy}{dt} - 2y = t^2$

4) $y' - y = \sin\left(e^{-x}\right)$

Use integrating factors to solve the initial value problems. You may need to use integration by parts in (7).

5) $y' = x - 2y\,,\ y(0) = 0$

6) $y' = 6xy + 6x\,,\ y(0) = 5$

7) $t^3\dfrac{dx}{dt} = e^{-t} - 4t^2 x\,,\ x(-1) = 0$

8) $(x^2 - 1)y' = x - 2xy\,,\ y(0) = 7$

Answers:

1) $y = e^{5x} + Ce^{4x}\,, \;\; D = \mathbb{R}$

2) $y = \dfrac{1}{3} + Ce^{-x^3}\,, \;\; D = \mathbb{R}$

3) $y = t^2 \log t + Ct^2\,, \;\; D = \{\, t > 0 \,\}$

4) $y = e^x \, \cos\left(\, e^{-x} \,\right) + Ce^x\,, \;\; D = \mathbb{R}$

5) $y = \dfrac{1}{4}e^{-2x} + \dfrac{1}{2}x - \dfrac{1}{4}$

6) $y = -1 + 6e^{3x^2}$

7) $x = -\dfrac{(t+1)e^{-t}}{t^4}$

8) $y = \dfrac{\frac{x^2}{2} - 7}{x^2 - 1}$