

# Math 6345 AODEs HW 1

1. Solve the following first order differential equations

$$(i) \quad x \frac{dy}{dx} - y = \frac{3x^5}{y}$$

$$(ii) \quad \frac{dy}{dx} = \frac{6x - y^4}{4xy^3 + 3}$$

$$(iii) \quad \frac{dy}{dx} = \frac{x - 3y}{3x + y}$$

$$(iv) \quad \frac{dy}{dx} = 4xy^2 - y^2 + 4x - 1, \quad y(1) = 0$$

2. For the following systems find the fundamental matrix  $\Phi(t)$  and  $e^{At}$

$$(i) \quad \frac{d\bar{x}}{dt} = \begin{pmatrix} 1 & 1 \\ 2 & 0 \end{pmatrix} \bar{x},$$

$$(ii) \quad \frac{d\bar{x}}{dt} = \begin{pmatrix} 1 & -1 \\ 1 & 3 \end{pmatrix} \bar{x},$$

$$(iii) \quad \frac{d\bar{x}}{dt} = \begin{pmatrix} 6 & -1 \\ 5 & 4 \end{pmatrix} \bar{x}.$$

**Due:** Thursday Sept. 10, 2020