Norwegian University of Science
and Technology
Department of Mathematical
Sciences

MA0002 Mathematical Methods B Spring 2023

Exercise set 6

1 Use integration by parts two times to solve the integral

$$\int e^x \sin(x) dx$$

2 Use partial fraction decomposition to solve the integral

$$\int_2^3 \frac{3x+2}{x^2-1} dx$$

3 Solve the differential equation with initial values

$$\frac{dy}{dx} = 2\frac{y}{x}, \text{ with } y_0 = 1, x_0 = 1$$

4 Let

$$\frac{dy}{dx} = (2-y)(y-3)$$

Find the points of equilibia and find out if they are stable or unstable.

5 Find the augmented matrix and use it to solve the linear system

$$\begin{aligned} 2x - y &= 3 \\ -x + y &= 1 \end{aligned}$$

6 In this task we will consider the matrices

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 7 & 7 & 7 \\ 6 & 6 & 6 \end{bmatrix}, C = \begin{bmatrix} 2 & 3 \\ 4 & 1 \\ -1 & 3 \end{bmatrix}, D = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ -1 & 1 & 1 \end{bmatrix}$$

a) Compute $A + B$.

b) Compute $A \cdot C$ and $C \cdot A$.

c) If it exists, compute the inverse matrix of D.