Homework 2 Solutions

CAS CS 132

Fall 2024

Problem 1

1. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

2. $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

3. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

4. $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

5. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

6. $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

7. $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

8. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Problem 2.1

$$\begin{bmatrix} 1 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

no solutions

Problem 2.2

$$\begin{bmatrix} 1 & 0 & 0 & 0 & -3 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

$$x_1 = -3$$

$$x_2 = 3$$

$$x_3 = -6$$

$$x_4 = 1$$

Problem 2.3

$$\begin{bmatrix} 0 & 1 & 0 & 2 & -1 & 0 & 0 & 30 \\ 0 & 0 & 1 & -1 & 4 & 0 & 0 & -14 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 6 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 12 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

x_1 is free

$x_2 = 30 - 2x_4 + x_5$

$x_3 = (-14) + x_4 - 4x_5$

x_4 is free

x_5 is free

$x_6 = 6$

$x_7 = 12$

Problem 2.4

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

no solution

Problem 3

$$\begin{bmatrix} 1 & 0 & -1/3 & 1 \\ 0 & 1 & 1/4 & 4 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$x_1 = 1 + \frac{1}{3} x_3$$

$$x_2 = 4 - \frac{1}{4} x_3$$

x_3 is free

$$(5, 1, 12)$$

Problem 4.1

$$x_1 = 4 + 3x_2 - 2x_4$$

x_2 is free

$$x_3 = (-2) + x_4$$

x_4 is free

Problem 4.2

$$\begin{bmatrix} 1 & -3 & 0 & 2 & 4 \\ 0 & 0 & 1 & -1 & -2 \end{bmatrix}$$

Note: The solution can have any number of all-zero rows at the end