.

MAT1105 Lineær algebra og numeriske metoder

OBLIG 1

Egil Furnes

Studentnummer: 693784

Seksjon 1.5

Oppgave 5)

a)

$$A = \begin{pmatrix} 1 & 0 & -3 \\ -2 & -3 & 2 \end{pmatrix} \quad x = \begin{pmatrix} -2 \\ 3 \\ -1 \end{pmatrix}$$

$$Ax = \begin{pmatrix} 1 * (-2) + 0 * 3 + (-3) * (-1) \\ (-2) * (-2) + (-3) * 3 + 2 * (-1) \end{pmatrix} = \begin{pmatrix} 1 \\ -7 \end{pmatrix}$$

b)

$$A = \begin{pmatrix} 2 & 0 \\ 3 & 1 \\ 6 & -2 \end{pmatrix} \quad x = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$Ax = \begin{pmatrix} 2 * 3 + 0 * (-2) \\ 3 * 3 + 1 * (-2) \\ 6 * 3 + (-2) * (-2) \end{pmatrix} = \begin{pmatrix} 6 \\ 7 \\ 22 \end{pmatrix}$$

c)

$$A = \begin{pmatrix} 2 & 1 & 0 \\ -3 & 4 & -2 \\ 1 & -3 & 2 \end{pmatrix} \quad x = \begin{pmatrix} 4 \\ 0 \\ 3 \end{pmatrix}$$

$$Ax = \begin{pmatrix} 2 * 4 + 1 * 0 + 0 * 3 \\ (-3) * 4 + 4 * 0 + (-2) * 3 \\ 1 * 4 + (-3) * 0 + 2 * 3 \end{pmatrix} = \begin{pmatrix} 8 \\ -18 \\ 10 \end{pmatrix}$$

Oppgave 7)

Vi benytter X=50, Y=70 og Z=80.

$$A = \begin{pmatrix} 0.7 & 0.3 & 0.4 \\ 0.1 & 0.5 & 0.2 \\ 0.2 & 0.2 & 0.4 \end{pmatrix} \quad b = \begin{pmatrix} 50 \\ 70 \\ 80 \end{pmatrix}$$

I dette tilfellet finner vi at handlevognene fordeler seg med 88 vogner X, 56 vogner Y og 56 vogner Z.

$$A \cdot b = \begin{pmatrix} 0.7 * 50 + 0.3 * 70 + 0.4 * 80 \\ 0.1 * 50 + 0.5 * 70 + 0.2 * 80 \\ 0.2 * 50 + 0.2 * 70 + 0.4 * 80 \end{pmatrix} = \begin{pmatrix} 88 \\ 56 \\ 56 \end{pmatrix}$$

Seksjon 1.6

Oppgave 6)

Vi har gitt følgende matriser:

$$A = \begin{pmatrix} 0 & 1 \\ 0 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 1 \\ 3 & 4 \end{pmatrix} \quad C = \begin{pmatrix} 2 & 5 \\ 3 & 4 \end{pmatrix} \quad D = \begin{pmatrix} 3 & 7 \\ 0 & 0 \end{pmatrix}$$

Regner ut AB:

$$AB = \begin{pmatrix} 0*1+1*3 & 0*1+1*4 \\ 0*1+2*3 & 0*1+2*4 \end{pmatrix} = \begin{pmatrix} 3 & 4 \\ 6 & 8 \end{pmatrix}$$

Regner ut AC:

$$AC = \begin{pmatrix} 0*2+1*3 & 0*5+1*4 \\ 0*2+2*3 & 0*5+2*4 \end{pmatrix} = \begin{pmatrix} 3 & 4 \\ 6 & 8 \end{pmatrix}$$

Finner med dette at AB=AC.

Deretter regner vi ut AD, og finner at AD=0:

$$AD = \begin{pmatrix} 0*3+1*0 & 0*7+1*0 \\ 0*3+2*0 & 0*7+2*0 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

Oppgave 14)

Benytter Python til å løse oppgaven, kode vises nedenfor.

```
import numpy as np

# Oppgaver til seksjon 1.6

# 1a)
print("\n1a\n")

A = np.array([[1,-2], [3,1]])
B = np.array([[2,-1], [1,2]])

print(A, "\n")
print(B, "\n")
print(f"AB =\n", np.dot(A, B), "\n")
print(f"BA = \n", np.dot(B, A), "\n")

# 1b)
print("\n1b\n")

A = np.array([[1,-1,0], [-2,0,1], [-1,2,1]])
B = np.array([[0,2,1], [-1,-2,0], [3,-1,2]])

print(A,"\n")
```

```python
print(B, "\n")
print(f"AB =\n", np.dot(A, B), "\n")
print(f"BA =\n", np.dot(B, A), "\n")

# 2)
print("\n2\n")

A = np.array([[1,-2,3], [0,-1,2]])
B = np.array([[2,1], [0,-3], [1,0]])

print(A,"\n")
print(B,"\n")
print(f"AB =\n", np.dot(A, B), "\n")

# 3)
print("\n3\n")

A = np.array([[1,-2], [3,0], [-1,2]])
B = np.array([[2,1,0], [-3,1,1]])

print(A,"\n")
print(B,"\n")
print(f"AB =\n", np.dot(A, B), "\n")
```

Nedenfor vises output fra terminalen, formattert og fjernet overflødig informasjon:

```
1a
AB =
 [[ 0 -5]
 [ 7 -1]]
BA =
 [[-1 -5]
 [ 7  0]]

1b
AB =
 [[ 1  4  1]
 [ 3 -5  0]
 [ 1 -7  1]]
BA =
 [[-5  2  3]
 [ 3  1 -2]
 [ 3  1  1]]

2
AB =
 [[5 7]
 [2 3]]
```

```
3
AB =
 [[ 8 -1 -2]
 [ 6  3  0]
 [-8  1  2]]
```

Seksjon 1.7

Oppgave 5)

$$A^-1 = \begin{pmatrix} 1 & 4 \\ 2 & 9 \end{pmatrix} \quad B^-1 = \begin{pmatrix} 8 & 3 \\ 2 & 1 \end{pmatrix}$$

$$(AB)^-1 = B^-1A^-1$$

$$B^-1A^-1 = \begin{pmatrix} 8*1+3*2 & 8*4+3*9 \\ 2*1+1*2 & 2*4+1*9 \end{pmatrix} = \begin{pmatrix} 14 & 59 \\ 4 & 17 \end{pmatrix} = (AB)^-1$$

Oppgave 8)

$$(AB)^T = B^T A^T$$
$$(AB)^-1 = B^-1A^-1$$

$$((AB)^-1)^T = (B^-1A^-1)^T$$
$$(B^-1A^-1)^T = (A^-1)^T(B^-1)^T$$

$$((AB)^T)^-1 = (A^-1)^T(B^-1)^T\square$$

Seksjon 1.8

Oppgave 10)

a)

$$a = \begin{bmatrix} 3 & -2 & -1 \\ 1 & 4 & 3 \\ 2 & 1 & 7 \end{bmatrix}$$

$$\det(a) = 3 * \begin{vmatrix} 4 & 3 \\ 1 & 7 \end{vmatrix} - (-2) * \begin{vmatrix} 1 & 3 \\ 2 & 7 \end{vmatrix} + (-1) * \begin{vmatrix} 1 & 4 \\ 2 & 1 \end{vmatrix}$$

$$\det(a) = 3*(4*7-3*1) - (-2)*(1*7-3*2) + (-1)*(1*1-4*2)$$
$$= 3*(28-3) + 2*(7-6) - 1*(-7) = 75 + 2 + 7 = 84$$

b)

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

$$\det(b) = (-2) * \begin{vmatrix} 3 & 3 \\ 0 & 4 \end{vmatrix} - 4 * \begin{vmatrix} -2 & 3 \\ 1 & 4 \end{vmatrix} + 0 * \begin{vmatrix} -2 & 3 \\ 1 & 0 \end{vmatrix}$$

$$\det(b) = -2 * (3 * 4 - 3 * 0) - 4 * (-2 * 4 - 3 * 1) + 0 * (-2 * 0 - 3 * 1)$$
$$= -2 * 12 - 4 * -11 = 20$$

c)

$$c = \begin{bmatrix} 1 & 2 & 3 \\ -2 & 5 & 4 \\ 3 & -3 & -1 \end{bmatrix}$$

$$\det(c) = 1 * \begin{vmatrix} 5 & 4 \\ -3 & -1 \end{vmatrix} - 2 * \begin{vmatrix} -2 & 4 \\ 3 & -1 \end{vmatrix} + 3 * \begin{vmatrix} -2 & 5 \\ 3 & -3 \end{vmatrix}$$

$$\det(c) = 1 * (5 * (-1) - 4 * (-3)) - 2 * ((-2) * (-1) - 4 * 3) + 3 * ((-2) * (-3) - 5 * 3)$$

$$= 7 - (-20) + -27 = 0$$