Fasit til utvalgte oppgaver MAT1110, uka 25-29/1

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Oppgave 2.6.1

b)

Vi har at

$$F_1(x,y,z) = e^{x^2y+z} \text{ og } F_2(x,y,z) = xyz^2.$$

Dette gir

$$\frac{\partial F_1}{\partial x} = 2xye^{x^2y+z},\ \frac{\partial F_1}{\partial y} = x^2e^{x^2y+z},\ \frac{\partial F_1}{\partial z} = e^{x^2y+z}$$

og

$$\frac{\partial F_2}{\partial x} = yz^2,\ \frac{\partial F_2}{\partial y} = xz^2,\ \frac{\partial F_2}{\partial z} = 2xyz.$$

Dermed blir Jacobimatrisen

$$F'(x,y,z) = \begin{pmatrix} 2xye^{x^2y+z} & x^2e^{x^2y+z} & e^{x^2y+z} \\ yz^2 & xz^2 & 2xyz \end{pmatrix}.$$

c)

Vi har at

$$F_1(x,y) = x\arctan(xy),\ F_2(x,y) = x\ln y,\ F_3(x,y) = xy\cos y^2.$$

Dette gir

$$\frac{\partial F_1}{\partial x} = \arctan(xy) + \frac{xy}{1+x^2y^2},\ \frac{\partial F_1}{\partial y} = \frac{x^2}{1+x^2y^2},$$

og

$$\frac{\partial F_2}{\partial x} = \ln y,\ \frac{\partial F_2}{\partial y} = \frac{x}{y},$$

og

$$\frac{\partial F_3}{\partial x} = y\cos y^2,\ \frac{\partial F_3}{\partial y} = x\cos y^2 - 2xy^2\sin y^2.$$

Dermed blir Jacobimatrisen

$$F'(x,y) = \begin{pmatrix} \arctan(xy) + \frac{xy}{1+x^2y^2} & \frac{x^2}{1+x^2y^2} \\ \ln y & \frac{x}{y} \\ y\cos y^2 & x\cos y^2 - 2xy^2\sin y^2 \end{pmatrix}.$$

d)

Vi har at

$$F_1(x,y,z,u) = xy\sin(xu^2),\ F_2(x,y,z,u) = z^2u.$$

Dette gir

$$\frac{\partial F_1}{\partial x} = y\sin(xu^2)+xyu^2\cos(xu^2),\ \frac{\partial F_1}{\partial y} = x\sin(xu^2),\ \frac{\partial F_1}{\partial z} = 0,\ \frac{\partial F_1}{\partial u} = 2x^2yu\cos(xu^2),$$

og

$$\frac{\partial F_2}{\partial x} = 0,\ \frac{\partial F_2}{\partial y} = 0,\ \frac{\partial F_2}{\partial z} = 2zu,\ \frac{\partial F_2}{\partial u} = z^2.$$

Dermed blir Jacobimatrisen

$$F'(x,y,z,u) = \begin{pmatrix} y\sin(xu^2)+xyu^2\cos(xu^2) & x\sin(xu^2) & 0 & 2x^2yu\cos(xu^2) \\ 0 & 0 & 2zu & z^2 \end{pmatrix}.$$

Oppgave 2.7.1

Vi regner ut at

$$\begin{aligned} \frac{\partial f}{\partial u} &= 2u,\ \frac{\partial f}{\partial v} = 1 \\ \frac{\partial g}{\partial x} &= 2y,\ \frac{\partial g}{\partial y} = 2x \\ \frac{\partial h}{\partial x} &= 1,\ \frac{\partial h}{\partial y} = 2y. \end{aligned}$$

Setter vi $\mathbf{G}(x,y) = (g(x,y),h(x,y))$ får vi derfor at $\mathbf{G}'(x,y) = \begin{pmatrix} 2y & 2x \\ 1 & 2y \end{pmatrix}$. Vi får så

$$\begin{aligned} (\frac{\partial k}{\partial x},\frac{\partial k}{\partial y}) &= (\frac{\partial f}{\partial u},\frac{\partial f}{\partial v})\mathbf{G}'(x,y) \\ &= (2u,1)\begin{pmatrix} 2y & 2x \\ 1 & 2y \end{pmatrix} \\ &= (2g(x,y),1)\begin{pmatrix} 2y & 2x \\ 1 & 2y \end{pmatrix} \\ &= (4xy,1)\begin{pmatrix} 2y & 2x \\ 1 & 2y \end{pmatrix} \\ &= (8xy^2+1, 8x^2y+2y). \end{aligned}$$

Oppgave 2.7.2

Vi setter

$$\begin{aligned} f(u,v) &= ue^{-v} \\ g(x,y,z) &= 2xy+z \\ h(x,y,z) &= 2y(z+x) \\ k(x,y,z) &= f(g(x,y,z),h(x,y,z)) \end{aligned}$$

Vi setter $G(x,y,z) = (g(x,y,z),h(x,y,z))$. Deriverer vi får vi

$$\begin{aligned} f'(u,v) &= \begin{pmatrix} \frac{\partial f}{\partial u} & \frac{\partial f}{\partial v} \end{pmatrix} = \begin{pmatrix} e^{-v} & -ue^{-v} \end{pmatrix} \\ G'(x,y,z) &= \begin{pmatrix} \frac{\partial g}{\partial x} & \frac{\partial g}{\partial y} & \frac{\partial g}{\partial z} \\ \frac{\partial h}{\partial x} & \frac{\partial h}{\partial y} & \frac{\partial h}{\partial z} \end{pmatrix} = \begin{pmatrix} 2y & 2x & 1 \\ 2y & 2(z+x) & 2y \end{pmatrix} \end{aligned}$$

Siden $k(x,y,z) = f(G(x,y,z))$ gir kjerneregelen oss at

$$\begin{aligned}
k'(x,y,z) &= \begin{pmatrix} \frac{\partial k}{\partial x} & \frac{\partial k}{\partial y} & \frac{\partial k}{\partial z} \end{pmatrix} \\
&= f'(G(x,y,z))G'(x,y,z) = f'(u,v)G'(x,y,z) \\
&= \begin{pmatrix} e^{-v} & -ue^{-v} \end{pmatrix} \begin{pmatrix} 2y & 2x & 1 \\ 2y & 2(z+x) & 2y \end{pmatrix} \\
&= \begin{pmatrix} 2ye^{-v}(1-u) & 2e^{-v}(x-u(z+x)) & e^{-v}(1-2yu) \end{pmatrix} \\
&= (2ye^{-2y(z+x)}(1-2xy-z) \\
&\quad ,2e^{-2y(z+x)}(x-(2xy+z)(z+x)) \\
&\quad ,e^{-2y(z+x)}(1-2y(2xy+z)))
\end{aligned}$$

og vi har dermed funnet de partielle deriverte til k.

Oppgave 2.7.5

Vi har at

$$\begin{aligned}
\mathbf{H}'(1,-2) &= \mathbf{F}'(\mathbf{G}(1,-2))\mathbf{G}'(1,-2) \\
&= \mathbf{F}'((1,2,3))\mathbf{G}'(1,-2) \\
&= \begin{pmatrix} 2 & 1 & 4 \\ 0 & 2 & 2 \end{pmatrix} \begin{pmatrix} 1 & -2 \\ 3 & 1 \\ 2 & -1 \end{pmatrix} \\
&= \begin{pmatrix} 13 & -7 \\ 10 & 0 \end{pmatrix}.
\end{aligned}$$

Oppgave 2.7.6

Vi har at

$$\begin{aligned}
\mathbf{H}'(-1,-2,1) &= \mathbf{F}'(2,4)\mathbf{G}'(-1,-2,1) = \begin{pmatrix} 2 & -3 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} 4 & -2 & 0 \\ 1 & 3 & -1 \end{pmatrix} \\
&= \begin{pmatrix} 5 & -13 & 3 \\ 2 & 6 & -2 \end{pmatrix}.
\end{aligned}$$

Oppgave 2.7.7

Fr kjerneregelen har vi at

$$\begin{aligned}
\frac{\partial E_1}{\partial t} &= E_1'(p_1(t), p_2(t)) \begin{pmatrix} p_1'(t) \\ p_2'(t) \end{pmatrix} \\
&= \left(\frac{\partial E_1}{\partial p_1}, \frac{\partial E_1}{\partial p_2} \right) \begin{pmatrix} p_1'(t) \\ p_2'(t) \end{pmatrix} \\
&= \frac{\partial E_1}{\partial p_1} p_1'(t) + \frac{\partial E_1}{\partial p_2} p_2'(t).
\end{aligned}$$

Oppgave 2.7.9

a)

Vi regner ut Jacobimatrisen for den sammensatte funksjonen på venstre side ved hjelp av kjerneregelen. Setter vi

$$\mathbf{G}(x_1, ..., x_n) = (x_1, ..., x_n, g(x_1, ..., x_n))$$

får vi at $\mathbf{G}'(x_1, ..., x_n)$ er en $(n+1) \times n$-matrise der de første n radene utgjør en $n \times n$ identitetsmatrise, og der siste rad er $\left(\frac{\partial g}{\partial x_1}, ..., \frac{\partial g}{\partial x_n}\right)$. Kjerneregelen gir derfor

$$\begin{aligned}
\mathbf{0} &= \left(\frac{\partial f}{\partial u_1}, ..., \frac{\partial f}{\partial u_{n+1}}\right) \mathbf{G}'(x_1, ..., x_n) \\
&= \left(\frac{\partial f}{\partial u_1} + \frac{\partial f}{\partial u_{n+1}} \frac{\partial g}{\partial x_1}, ..., \frac{\partial f}{\partial u_n} + \frac{\partial f}{\partial u_{n+1}} \frac{\partial g}{\partial x_n}\right),
\end{aligned}$$

der den i'te komponenten er $\frac{\partial f}{\partial u_i} + \frac{\partial f}{\partial u_{n+1}} \frac{\partial g}{\partial x_i}$. Skal denne være 0 må

$$\frac{\partial g}{\partial x_i} = -\frac{\frac{\partial f}{\partial u_i}}{\frac{\partial f}{\partial u_{n+1}}}.$$

Setter vi inn for selve punktet blir dette

$$\frac{\partial g}{\partial x_i}(x_1, ..., x_n) = -\frac{\frac{\partial f}{\partial x_i}(x_1, ..., x_n, g(x_1, ..., x_n))}{\frac{\partial f}{\partial x_{n+1}}(x_1, ..., x_n, g(x_1, ..., x_n))}.$$

b)

Siden $\frac{\partial f}{\partial x} = 2x$, $\frac{\partial f}{\partial y} = 2y$, så følger det fra a) at

$$g'(x) = -\frac{2x}{2y} = -\frac{2x}{2g(x)} = -\frac{x}{g(x)}.$$

Kurven $y = g(x)$ ligger på sirkelen $x^2 + y^2 = R^2$. Likningen over kan skrives om til at $(x, g(x)) \cdot (1, g'(x)) = 0$, som bare sier at vektoren står vinkelrett på tangenten til sirkelen, som jo er opplagt for sirkler.

c)

Siden $\frac{\partial f}{\partial x} = 2x$, $\frac{\partial f}{\partial y} = 2y$, $\frac{\partial f}{\partial z} = 2z$, så følger det fra a) at

$$\begin{aligned}
\frac{\partial g}{\partial x}(x, y) &= -\frac{2x}{2z} = -\frac{x}{g(x, y)} \\
\frac{\partial g}{\partial y}(x, y) &= -\frac{2y}{2z} = -\frac{y}{g(x, y)}.
\end{aligned}$$

Flaten $z = g(x, y)$ ligger på kula $x^2 + y^2 + z^2 = R^2$. Identitetene kan skrives om til henholdsvis $(x, y, g(x, y)) \cdot (1, 0, \frac{\partial g}{\partial x}(x, y)) = 0$ og $(x, y, g(x, y)) \cdot (0, 1, \frac{\partial g}{\partial y}(x, y)) = 0$, som sier at vektoren $(x, y, g(x, y))$ står vinkelrett på fartsretningene vi får når vi holder x konstant, eller y konstant.

Oppgave 2.8.1

Vi ser umiddelbart at

$$\begin{aligned}
T(\mathbf{e}_1) &= \begin{pmatrix} 2 \\ -1 \end{pmatrix} \\
T(\mathbf{e}_2) &= \begin{pmatrix} -1 \\ 1 \end{pmatrix} \\
T(\mathbf{e}_3) &= \begin{pmatrix} 1 \\ -3 \end{pmatrix}
\end{aligned}$$

Vi har derfor at matrisen til T er

$$A = [T(\mathbf{e}_1) \quad T(\mathbf{e}_2) \quad T(\mathbf{e}_3)] = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 1 & -3 \end{pmatrix}.$$

Oppgave 2.8.3

Vi har at

$$\begin{aligned} T(3\mathbf{a}-2\mathbf{b}) &= 3T(\mathbf{a})-2T(\mathbf{b}) \\ &= 3\begin{pmatrix} -2 \\ 1 \end{pmatrix} - 2\begin{pmatrix} 0 \\ 3 \end{pmatrix} \\ &= \begin{pmatrix} -6 \\ 3 \end{pmatrix} + \begin{pmatrix} 0 \\ -6 \end{pmatrix} = \begin{pmatrix} -6 \\ -3 \end{pmatrix} \end{aligned}$$

Oppgave 2.8.5

Vi har at $T(\mathbf{e}_1) = (1,0)$, $T(\mathbf{e}_2) = (0,2)$. Derfor blir matrisen til T

$$A = [T(\mathbf{e}_1) \quad T(\mathbf{e}_2)] = \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}.$$

Oppgave 2.8.7

Den lineære avbildningen her sender (x,y,z) på $(x,y,0)$. Derfor har vi

$$\begin{aligned} T(\mathbf{e}_1) &= (1,0,0) \\ T(\mathbf{e}_2) &= (0,1,0) \\ T(\mathbf{e}_3) &= (0,0,0). \end{aligned}$$

Derfor blir matrisen

$$A = [T(\mathbf{e}_1) \quad T(\mathbf{e}_2) \quad T(\mathbf{e}_3)] = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

Oppgave 2.8.14

Vi setter $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$

a)

Vi setter $\mathbf{v}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$. Vi får at

$$A\mathbf{v}_1 = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 1+2 \\ 2+1 \end{pmatrix} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} = 3\begin{pmatrix} 1 \\ 1 \end{pmatrix} = 3\mathbf{v}_1.$$

Vi ser derfor at $\mathbf{v}_1$ er en egenvektor for A med tilhørende egenverdi $\lambda_1 = 3$.

b)

Vi setter $\mathbf{v}_2 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$. Vi får at

$$A\mathbf{v}_2 = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 1-2 \\ 2-1 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \end{pmatrix} = (-1)\begin{pmatrix} 1 \\ -1 \end{pmatrix} = (-1)\mathbf{v}_2.$$

Vi ser derfor at $\mathbf{v}_2$ er en egenvektor for A med tilhørende egenverdi $\lambda_2 = -1$.

c)

Vi setter $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$. Vi setter

$$\begin{aligned} \mathbf{a} = x\mathbf{v}_1 + y\mathbf{v}_2 \\ \begin{pmatrix} 3 \\ -1 \end{pmatrix} &= x\begin{pmatrix} 1 \\ 1 \end{pmatrix} + y\begin{pmatrix} 1 \\ -1 \end{pmatrix}. \end{aligned}$$

Dette svarer til de to likningene

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

Legger vi disse sammen, og trekker de fra hverandre får vi først at $2x = 2, 2y = 4$, og deretter $x = 1, y = 2$, slik at $\mathbf{a} = \mathbf{v}_1 + 2\mathbf{v}_2$. Dermed blir

$$\begin{aligned} A^{10}\mathbf{a} &= A^{10}(\mathbf{v}_1 + 2\mathbf{v}_2) = A^{10}\mathbf{v}_1 + 2A^{10}\mathbf{v}_2 \\ &= 3^{10}\mathbf{v}_1 + 2(-1)^{10}\mathbf{v}_2 \\ &= 3^{10}\begin{pmatrix} 1 \\ 1 \end{pmatrix} + 2\begin{pmatrix} 1 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 3^{10} + 2 \\ 3^{10} - 2 \end{pmatrix}. \end{aligned}$$

Oppgave 2.9.1

Vi ser at

$$\begin{aligned} \mathbf{F}(x, y, z) &= \begin{pmatrix} 2x - 3y + z - 7 \\ -x + z - 2 \end{pmatrix} \\ &= \begin{pmatrix} 2x - 3y + z \\ -x + z \end{pmatrix} + \begin{pmatrix} -7 \\ -2 \end{pmatrix} \\ &= \begin{pmatrix} 2 & -3 & 1 \\ -1 & 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} + \begin{pmatrix} -7 \\ -2 \end{pmatrix}. \end{aligned}$$

Vi ser derfor at $A = \begin{pmatrix} 2 & -3 & 1 \\ -1 & 0 & 1 \end{pmatrix}$, og at $\mathbf{c} = \begin{pmatrix} -7 \\ -2 \end{pmatrix}$.

Oppgave 2.9.2

Vi ser at

$$\begin{aligned} \mathbf{F}(\mathbf{r}(t)) &= \begin{pmatrix} 1 & -1 & 2 \\ 0 & 3 & -2 \end{pmatrix}\mathbf{r}(t) + \begin{pmatrix} 2 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 1 & -1 & 2 \\ 0 & 3 & -2 \end{pmatrix}\left(\begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} + t\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}\right) + \begin{pmatrix} 2 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 2 + t + 1 + 6 + 4t \\ -3 - 6 - 4t \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 5t + 9 \\ -4t - 9 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} \\ &= t\begin{pmatrix} 5 \\ -4 \end{pmatrix} + \begin{pmatrix} 11 \\ -10 \end{pmatrix}, \end{aligned}$$

som gir oss en parametrisering av $\mathbf{F}(\mathcal{L})$.

Oppgave 2.9.5

Vi har at

$$\begin{aligned}
\mathbf{F}(0,0) &= \begin{pmatrix} 1 \\ -1 \end{pmatrix} \\
\mathbf{F}(1,0) &= \begin{pmatrix} 2 \\ 3 \end{pmatrix} \\
\mathbf{F}(0,1) &= \begin{pmatrix} -1 \\ 0 \end{pmatrix}
\end{aligned}$$

Vi setter nå inn de tre koordinatene i uttrykket

$$\mathbf{F}(x,y) = A\begin{pmatrix} x \\ y \end{pmatrix} + \mathbf{c} = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \mathbf{c}$$

og får:

$$\begin{aligned}
\mathbf{F}(0,0) &= \mathbf{c} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \\
\mathbf{F}(1,0) &= \begin{pmatrix} a_{11} \\ a_{21} \end{pmatrix} + \mathbf{c} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \\
\mathbf{F}(0,1) &= \begin{pmatrix} a_{12} \\ a_{22} \end{pmatrix} + \mathbf{c} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}.
\end{aligned}$$

De to siste likningene gir

$$\begin{aligned}
\begin{pmatrix} a_{11} \\ a_{21} \end{pmatrix} &= \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \mathbf{c} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 1 \\ 4 \end{pmatrix} \\
\begin{pmatrix} a_{12} \\ a_{22} \end{pmatrix} &= \begin{pmatrix} -1 \\ 0 \end{pmatrix} - \mathbf{c} = \begin{pmatrix} -1 \\ 0 \end{pmatrix} - \begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}.
\end{aligned}$$

Vi ser derfor at

$$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = \begin{pmatrix} 1 & -2 \\ 4 & 1 \end{pmatrix},$$

og derfor er

$$\mathbf{F}(x,y) = A\begin{pmatrix} x \\ y \end{pmatrix} + \mathbf{c} = \begin{pmatrix} 1 & -2 \\ 4 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

Matlab-kode

```
% Oppgave 1.1
2.2+4.7
5/7
3^2
(2.3-4^2)/(13-2.2^2)
```

```
% Oppgave 1.2
exp(1)
sqrt(16)
cos(pi)
sin(pi/6)
tan(pi/4)
asin(1/2)
atan(1)
```

```
% Oppgave 1.3
x=0.762
y=sqrt(9.56)+exp(-1)
x+y
x*y
x/y
sin(x^2)*y
```

```
% Oppgave 2.1
A=[1 3 4 6; -1 1 3 -5; 2 -3 1 6; 2 3 -2 1];
B=[2 2 -1 4; 2 -1 4 6; 2 3 2 -1; -1 4 -2 5];
A'
B'
(A*B)'
A'*B'
B'*A'
inv(A)
inv(B)
inv(A*B)
inv(A)*inv(B)
inv(B)*inv(A)
```

```
% Oppgave 2.3
A=[ 1 2 -1; 3 -1 0; -4 0 2];
inv(A)
A'
det(A)
[V,D]=eig(A)
```

```
% Oppgave 3.1
a=[1 -9 7 5 -7];
b=[pi -14 exp(1) 7/3];
c=1:2:99
d=124:(-4):0
```

```
% Oppgave 3.2
e=2.^(0:12)
sum(e)
```

```
% Oppgave 4.1
a=[3 1 -2 5 4 3];
b=[4 1 -1 5 3 1];
plot(a,b)
plot(a)
hold on
plot(b)
```

```
% Oppgave 4.3
x=-1:0.05:1;
plot(x,x.^3-1)
hold on
plot(x,3*x.^2,'r')
```

```
% Oppgave 4.4
x=-1:0.01:1;
plot(x,sin(1./x))
x=-1:0.0001:1;
plot(x,sin(1./x))
```

Python-kode

```
# Oppgave 1.1
print 2.2+4.7
print 5.0/7.0
print 3**2
print (2.3-4**2)/(13-2.2**2)
```

```
# Oppgave 1.2
print exp(1)
print sqrt(16)
print cos(pi)
print sin(pi/6.0)
print tan(pi/4.0)
print asin(1.0/2.0)
print atan(1.0)
```

```
# Oppgave 1.3
from math import *

x=0.762
y=sqrt(9.56)+exp(-1.0)
print x+y
print x*y
print x/y
print sin(x**2)*y
```

```
# Oppgave 2.1
from numpy import *

A=matrix([[1,3,4,6],[-1,1,3,-5],[2,-3,1,6],[2,3,-2,1]])
B=matrix([[2,2,-1,4],[2,-1,4,6],[2,3,2,-1],[-1,4,-2,5]])
print A.T
print B.T
print (A*B).T
print (A.T)*(B.T)
print (B.T)*(A.T)
print linalg.inv(A)
print linalg.inv(B)
print linalg.inv(A*B)
print linalg.inv(A)*linalg.inv(B)
print linalg.inv(B)*linalg.inv(A)
```

```
# Oppgave 2.3
A=matrix([[1,2,-1],[3,-1,0],[-4,0,2]])
print linalg.inv(A)
print A.T
print linalg.det(A)
D,V=linalg.eig(A)
print D
print V
```

```
# Oppgave 3.1
a=matrix([1,-9,7,5,-7])
b=matrix([pi,-14,e,7.0/3.0])
c=range(1,100,2)
d=range(124,-1,-4)
```

```
# Oppgave 3.2
a=range(1,4097,1)
print sum(a)
```

```
# Oppgave 4.1
a=array([3,1,-2,5,4,3])
b=array([4,1,-1,5,3,1])
plot(a,b)
figure(2)
plot(a)
hold('on')
plot(b)
```

```
# Oppgave 4.3
from numpy import *
from scitools.easyviz import *

x=linspace(-1,1,100)
f=x**3 - 1
g=3*x**2
plot(x,f,'g')
hold('on')
plot(x,g,'r')
```

```
# Oppgave 4.3
x=arange(-1,1.01,0.01)
f=sin(1.0/x)
plot(x,f,'g')
x=arange(-1,1.0001,0.0001)
f=sin(1.0/x)
figure(2)
plot(x,f,'r')
```