Untitled2

November 2, 2022

```
[1]: import sympy as sp
     from sympy.solvers import solve
```

```
[2]: #1a)oppgave sett 15
     x, y = sp.symbols("x y")
     unknown = [x, y]
     eq_a = [
         sp.Eq(2*x+4*y,6),
         sp.Eq(-2*x+y,4)
     ]
     eq_a[1]
```

[2]: $$-2x + y = 4$$

```
[9]: sp.solve(eq_a, unknown)
```

[9]: {x: -1, y: 2}

```
[6]: #1b
     eq_b = [
         sp.Eq(2*x-y,-1),
         sp.Eq(x**2+x-y,1)
     ]
     eq_b[1]
```

[6]: $$x^2 + x - y = 1$$

```
[7]: sp.solve(eq_b, unknown)
```

[7]: [(-1, -1), (2, 5)]

```
[8]: #2a
     eq_c = [
         sp.Eq(3*x-12,-6*y),
         sp.Eq(4*x-8*y,16)
     ]
     eq_c[0]
```

[8]: $$3x - 12 = -6y$$

```
[11]: sp.solve(eq_c, unknown)
```

```
[11]: {x: 4, y: 0}
```

```
[18]: #2b
      eq_d = [
          sp.Eq(x**2+4*x-3,3*y),
          sp.Eq(2*y,8-x)
      ]
      eq_d[0]
```

[18]: $x^2 + 4x - 3 = 3y$

```
[19]: sp.solve(eq_d, unknown)
```

```
[19]: [(-15/2, 31/4), (2, 3)]
```

```
[20]: #oppgavesett 16 1a)
      eq_aa = [
          sp.Eq(4*x+2*y,12),
          sp.Eq(6*x-2*y,8)
      ]
      eq_aa[0]
```

[20]: $4x + 2y = 12$

```
[21]: sp.solve(eq_aa, unknown)
```

```
[21]: {x: 2, y: 2}
```

```
[22]: #1b
      eq_bb = [
          sp.Eq(2*x+y**2,25),
          sp.Eq(x-2*y,10)
      ]
      eq_bb[0]
```

[22]: $2x + y^2 = 25$

```
[23]: sp.solve(eq_bb, unknown)
```

```
[23]: [(0, -5), (12, 1)]
```

```
[24]: #2a
      eq_cc = [
          sp.Eq(4*x-4*y,8),
          sp.Eq(9*x-5*y,26)
      ]
      eq_cc[0]
```

[24]:

$$4x - 4y = 8$$

[25]:
```python
sp.solve(eq_cc, unknown)
```

[25]: {x: 4, y: 2}

[27]:
```python
#2b
eq_dd=[
    sp.Eq(x+2*y**2,15),
    sp.Eq(x**2-4*y**2,33)
]
eq_dd[0]
```

[27]:
$$x + 2y^2 = 15$$

[30]:
```python
sp.solve(eq_dd, unknown)
```

[30]: [(-9, -2*sqrt(3)), (-9, 2*sqrt(3)), (7, -2), (7, 2)]

[31]:
```python
#oppgavesett 17 1a
eq_1a = [
    sp.Eq(x*y**2-x,0),
    sp.Eq(x+y**2,16)
]
eq_1a[0]
```

[31]:
$$xy^2 - x = 0$$

[32]:
```python
sp.solve(eq_1a, unknown)
```

[32]: [(0, -4), (0, 4), (15, -1), (15, 1)]

[35]:
```python
#1b
eq_1b = [
    sp.Eq(x**2+y**2,100),
    sp.Eq(x**2*y-36*y,0)
]
eq_1b[0]
```

[35]:
$$x^2 + y^2 = 100$$

[36]:
```python
sp.solve(eq_1b, unknown)
```

[36]: [(-10, 0), (-6, -8), (-6, 8), (6, -8), (6, 8), (10, 0)]

[42]:
```python
#2a
eq_2a =[
    sp.Eq(x*y**2-49*x,0),
    sp.Eq(x**2+y**2,58)
]
```

```
eq_2a[0]
```

[42]: $xy^2 - 49x = 0$

[43]:
```
sp.solve(eq_2a, unknown)
```

[43]: `[(-3, -7), (-3, 7), (0, -sqrt(58)), (0, sqrt(58)), (3, -7), (3, 7)]`

[10]:
```
#2b
eq_2b = [
    sp.Eq(x**2+y**2,5/4),
    sp.Eq(2*x*y+y,0)
]
eq_2b[0]
```

[10]: $x^2 + y^2 = 1.25$

[12]:
```
sp.solve(eq_2b,unknown)
```

[12]:
```
[(-1.11803398874989, 0.0),
 (-0.500000000000000, -1.00000000000000),
 (-0.500000000000000, 1.00000000000000),
 (1.11803398874989, 0.0)]
```

[48]:
```
#oppagvesett 19 1a
eq1a = x**5
eq1a
```

[48]: x^5

[49]:
```
sp.diff(eq1a,x)
```

[49]: $5x^4$

[50]:
```
#1b
eq1b = x + 12
eq1b
```

[50]: $x + 12$

[51]:
```
sp.diff(eq1b,x)
```

[51]: 1

[54]:
```
#1c
eq1c = x**3+4*x**2
eq1c
```

[54]: $x^3 + 4x^2$

[55]:
```
sp.diff(eq1c,x)
```

[55]: $3x^2 + 8x$

[12]:
```
#1d
def d19(x):
    return 2*x**3+ sp.sqrt(36)
d19(x)
```

[12]: $2x^3 + 6$

[13]:
```
sp.diff(d19(x),x)
```

[13]: $6x^2$

[15]:
```
#man kan også definrere den først for samme svar
eq1 = 2*x**3 + sp.sqrt(36)
eq1
```

[15]: $2x^3 + 6$

[16]:
```
sp.diff(eq1,x)
```

[16]: $6x^2$

[56]:
```
#1e
eq1e = sp.sqrt(x)+5**2
eq1e
```

[56]: $\sqrt{x} + 25$

[57]:
```
sp.diff(eq1e,x)
```

[57]: $\dfrac{1}{2\sqrt{x}}$

[58]:
```
#1f
eq1f = x**3 + 1/x
eq1f
```

[58]: $x^3 + \dfrac{1}{x}$

[59]:
```
sp.diff(eq1f,x)
```

[59]: $3x^2 - \dfrac{1}{x^2}$

[61]:
```
#1g
eq1g = x**3-x**2 + 1/4*x
eq1g
```

[61]: $x^3 - x^2 + 0.25x$

[62]:
```
sp.diff(eq1g,x)
```

[62]: $3x^2 - 2x + 0.25$

[64]:
```
#2a
eq2a = 1/x+6*x**6
eq2a
```

[64]: $6x^6 + \dfrac{1}{x}$

[65]:
```
sp.diff(eq2a,x)
```

[65]: $36x^5 - \dfrac{1}{x^2}$

[66]:
```
#2b
eq2b = -x+1/2*x**3
eq2b
```

[66]: $0.5x^3 - x$

[68]:
```
sp.diff(eq2b,x)
```

[68]: $1.5x^2 - 1$

[70]:
```
#2c
eq2c = x*(x**2+2*x-3)
eq2c
```

[70]: $x\left(x^2 + 2x - 3\right)$

[71]:
```
sp.diff(eq2c,x)
```

[71]: $x^2 + x\left(2x + 2\right) + 2x - 3$

[17]:
```
#oppgavesett 20
#1a
sp.root(x**12,3)
```

[17]: $\sqrt[3]{x^{12}}$

[72]:
```
#1b
sp.root((x**2+4)**4,8)
```

[72]: $\sqrt[8]{\left(x^2 + 4\right)^4}$

[95]:
```
#1c
sp.sqrt(x)* sp.root(x,3)
```

[95]: $x^{\frac{5}{6}}$

[88]:
```
#1d
sp.root((x+2)**1/2,4)
```

[88]:

$$\sqrt[4]{\frac{x}{2}+1}$$

[89]:
```
#1e
ew1e = x**4*x**5
ew1e
```

[89]: x^9

[90]:
```
sp.diff(ew1e, x)
```

[90]: $9x^8$

[93]:
```
#1f
ew1f = x*sp.sqrt(x)
ew1f
```

[93]: $x^{\frac{3}{2}}$

[96]:
```
sp.diff(ew1f,x)
```

[96]: $\dfrac{3\sqrt{x}}{2}$

[97]:
```
#1g
ew1g = 2/x**3
ew1g
```

[97]: $\dfrac{2}{x^3}$

[98]:
```
sp.diff(ew1g,x)
```

[98]: $-\dfrac{6}{x^4}$

[99]:
```
#1h
ew1h = x**2-2/x**3
ew1h
```

[99]: $x^2 - \dfrac{2}{x^3}$

[100]:
```
sp.diff(ew1h,x)
```

[100]: $2x + \dfrac{6}{x^4}$

[101]:
```
#1i
ew1i = sp.sqrt(x)*x**6
ew1i
```

[101]: $x^{\frac{13}{2}}$

[102]:
```
sp.diff(ew1i,x)
```

[102]: $$\frac{13x^{\frac{11}{2}}}{2}$$

[104]:
```
#1j
ew1j = x*(x**2+1)
ew1j
```

[104]: $$x\left(x^2+1\right)$$

[105]:
```
sp.diff(ew1j,x)
```

[105]: $$3x^2+1$$

[106]:
```
#1k
ew1k = x**2+4/x**3-1
ew1k
```

[106]: $$x^2-1+\frac{4}{x^3}$$

[107]:
```
sp.diff(ew1k,x)
```

[107]: $$2x-\frac{12}{x^4}$$

[108]:
```
#1l
ew1l = x**2/x**2+2*x
ew1l
```

[108]: $$2x+1$$

[109]:
```
sp.diff(ew1l,x)
```

[109]: $$2$$

[110]:
```
#1m
ew1m = x**2+4*x+2/x-2
ew1m
```

[110]: $$x^2+4x-2+\frac{2}{x}$$

[111]:
```
sp.diff(ew1m,x)
```

[111]: $$2x+4-\frac{2}{x^2}$$

[112]:
```
#2a
ew2a = x**3-2*x/x**2-1
ew2a
```

[112]: $$x^3-1-\frac{2}{x}$$

[113]:
```
sp.diff(ew2a,x)
```

[113]:
$$3x^2 + \frac{2}{x^2}$$

[114]:
```
#2b
ew2b = (x**2+1)*(x**2-1)
ew2b
```

[114]:
$$\left(x^2 - 1\right)\left(x^2 + 1\right)$$

[115]:
```
sp.diff(ew2b,x)
```

[115]:
$$2x\left(x^2 - 1\right) + 2x\left(x^2 + 1\right)$$

[116]:
```
#2c
ew2c = 3*x-4/x**3+7
ew2c
```

[116]:
$$3x + 7 - \frac{4}{x^3}$$

[117]:
```
sp.diff(ew2c,x)
```

[117]:
$$3 + \frac{12}{x^4}$$

[118]:
```
#oppgavesett 21
#1a
e21a = (x**3+6*x)**5
e21a
```

[118]:
$$\left(x^3 + 6x\right)^5$$

[119]:
```
sp.diff(e21a,x)
```

[119]:
$$\left(15x^2 + 30\right)\left(x^3 + 6x\right)^4$$

[120]:
```
#1b
e21b = sp.sqrt(2*x**2+5)
e21b
```

[120]:
$$\sqrt{2x^2 + 5}$$

[121]:
```
sp.diff(e21b,x)
```

[121]:
$$\frac{2x}{\sqrt{2x^2 + 5}}$$

[122]:
```
#1c
e21c = (2*x/x**2+3)**4
e21c
```

[122]:
$$\left(3 + \frac{2}{x}\right)^4$$

```
[123]: sp.diff(e21c,x)
```

[123]:
$$-\frac{8\left(3+\frac{2}{x}\right)^3}{x^2}$$

```
[124]: #1d
       e21d = (2*x**4 + 9)**3/2
       e21d
```

[124]:
$$\frac{\left(2x^4+9\right)^3}{2}$$

```
[125]: sp.diff(e21d,x)
```

[125]:
$$12x^3\left(2x^4+9\right)^2$$

```
[126]: #1e
       e21e = 1/sp.sqrt(1+x**2)
       e21e
```

[126]:
$$\frac{1}{\sqrt{x^2+1}}$$

```
[127]: sp.diff(e21e,x)
```

[127]:
$$-\frac{x}{\left(x^2+1\right)^{\frac{3}{2}}}$$

```
[128]: #1f
       e21f = x**2*(x**2+2*x)**3
       e21f
```

[128]:
$$x^2\left(x^2+2x\right)^3$$

```
[130]: sp.diff(e21f,x)
```

[130]:
$$x^2\cdot(6x+6)\left(x^2+2x\right)^2+2x\left(x^2+2x\right)^3$$

```
[131]: #1g
       e21g = x**2 * sp.sqrt(x**2-2*x)
       e21g
```

[131]:
$$x^2\sqrt{x^2-2x}$$

```
[132]: sp.diff(e21g,x)
```

[132]:
$$\frac{x^2\left(x-1\right)}{\sqrt{x^2-2x}}+2x\sqrt{x^2-2x}$$

```
[133]: #1h
       e21h = x**2/(x**2+x)**3
       e21h
```

[133]:

$$\frac{x^2}{\left(x^2+x\right)^3}$$

[135]:
```
sp.diff(e21h,x)
```

[135]:
$$\frac{x^2\left(-6x-3\right)}{\left(x^2+x\right)^4}+\frac{2x}{\left(x^2+x\right)^3}$$

[137]:
```
#1i
e21i = (x**2+1)**2*(x**3+1)**3
e21i
```

[137]:
$$\left(x^2+1\right)^2\left(x^3+1\right)^3$$

[139]:
```
sp.diff(e21i,x)
```

[139]:
$$9x^2\left(x^2+1\right)^2\left(x^3+1\right)^2+4x\left(x^2+1\right)\left(x^3+1\right)^3$$

[141]:
```
#2a
eq21a = sp.sqrt((3*x**2+2*x)**4)
eq21a
```

[141]:
$$\sqrt{\left(3x^2+2x\right)^4}$$

[143]:
```
sp.diff(eq21a,x)
```

[143]:
$$\frac{\left(24x+8\right)\sqrt{\left(3x^2+2x\right)^4}}{2\cdot\left(3x^2+2x\right)}$$

[144]:
```
#2b
eq21b = (x**3+3)**5*(x**2+3)**4
eq21b
```

[144]:
$$\left(x^2+3\right)^4\left(x^3+3\right)^5$$

[146]:
```
sp.diff(eq21b,x)
```

[146]:
$$15x^2\left(x^2+3\right)^4\left(x^3+3\right)^4+8x\left(x^2+3\right)^3\left(x^3+3\right)^5$$

[147]:
```
#2c
eq21c = sp.sqrt(x**2+1*x**2)
eq21c
```

[147]:
$$\sqrt{2}\sqrt{x^2}$$

[148]:
```
sp.diff(eq21c,x)
```

[148]:
$$\frac{\sqrt{2}\sqrt{x^2}}{x}$$

[149]:
```
#2d
eq21d = (2*x+3*x**2)**3/x**2
```

```
eq21d
```

[149]: $$\frac{\left(3x^2 + 2x\right)^3}{x^2}$$

[151]:
```
sp.diff(eq21d,x)
```

[151]: $$\frac{(18x + 6)\left(3x^2 + 2x\right)^2}{x^2} - \frac{2\left(3x^2 + 2x\right)^3}{x^3}$$

[9]:
```
#2e
eq21e = sp.root(x**4-5,3)
eq21e
```

[9]: $$\sqrt[3]{x^4 - 5}$$

[11]:
```
sp.diff(eq21e,x)
```

[11]: $$\frac{4x^3}{3\left(x^4 - 5\right)^{\frac{2}{3}}}$$

[12]:
```
#2f
eq21f = x**3/sp.sqrt(x**4-1)
eq21f
```

[12]: $$\frac{x^3}{\sqrt{x^4 - 1}}$$

[13]:
```
sp.diff(eq21f,x)
```

[13]: $$-\frac{2x^6}{\left(x^4 - 1\right)^{\frac{3}{2}}} + \frac{3x^2}{\sqrt{x^4 - 1}}$$

[18]:
```
#oppgavesett22
#1a
from numpy import log as ln
import math
sp.diff(sp.log(5*x),x)
```

[18]: $$\frac{1}{x}$$

[15]:
```
#1b
sp.diff(sp.exp(-2*x),x)
```

[15]: $$-2e^{-2x}$$

[19]:
```
#1c
sp.diff(sp.log(12*x)-3,x)
```

[19]: $$\frac{1}{x}$$

```
[24]: #1d
      sp.diff(2**x)
```

[24]: $2^x \log(2)$

```
[25]: #1e
      sp.diff(sp.exp(3*x+5),x)
```

[25]: $3e^{3x+5}$

```
[26]: #1f
      sp.diff(sp.log(x**5+1),x)
```

[26]: $\dfrac{5x^4}{x^5+1}$

```
[4]: #1g
     sp.diff(sp.exp(4*x**2+8*x),x)
```

[4]: $(8x+8)\,e^{4x^2+8x}$

```
[5]: #1h
     sp.diff(sp.log(1/x),x)
```

[5]: $-\dfrac{1}{x}$

```
[11]: #1i
      sp.diff(6 * sp.log(x) +3 *sp.exp(4*x),x)
```

[11]: $12e^{4x} + \dfrac{6}{x}$

```
[32]: #1j
      sp.diff(x*sp.exp(-x),x)
```

[32]: $-xe^{-x} + e^{-x}$

```
[34]: #1k
      sp.diff(x**2*sp.log(x**2+2),x)
```

[34]: $\dfrac{2x^3}{x^2+2} + 2x \log(x^2+2)$

```
[37]: #2a
      sp.diff(x**3*sp.exp(2*x),x)
```

[37]: $2x^3 e^{2x} + 3x^2 e^{2x}$

```
[38]: #2b
      sp.diff(sp.log(x**2-1/x**2+1),x)
```

[38]: $\dfrac{2x + \frac{2}{x^3}}{x^2 + 1 - \frac{1}{x^2}}$

```
[39]: #2c
      sp.diff(x**2*sp.log(x**2+2),x)
```

$[39]: \dfrac{2x^3}{x^2+2} + 2x\log\left(x^2+2\right)$

```
[15]: #2d
      sp.diff(sp.exp(-x)/(x**2+1))
```

$[15]: -\dfrac{2xe^{-x}}{\left(x^2+1\right)^2} - \dfrac{e^{-x}}{x^2+1}$