sok_1003_sympy

October 28, 2021

[1]:
```
import sympy as sp
import numpy as np
import matplotlib.pyplot as plt
from sympy.solvers import solve
from sympy import *

x,y = sp.symbols('x y')
```

1 Likningsett 15

Oppgave 1a

[2]:
```
eq1=sp.Eq(2*x + 4*y,6)
eq1
```

[2]: $2x + 4y = 6$

[3]:
```
eq2=sp.Eq(-2*x + y,4)
eq2
```

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

[4]:
```
 solve ([eq1,eq2], [x,y])
```

[4]:
```
{x: -1, y: 2}
```

Oppgave 1b

[5]:
```
eq3=sp.Eq(2*x + -y,-1)
eq3
```

[5]: $2x - y = -1$

[6]:
```
eq4=sp.Eq(x**2 + x - y,1)
eq4
```

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

[7]:
```
solve ([eq3,eq4], [x,y])
```

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

Oppgave 2a

[8]:
```
Variable = 12
```

[9]:
```
eq5=sp.Eq(x*3 - 12,-6*y)
eq5
```

[9]: $3x - 12 = -6y$

[10]:
```
eq6=sp.Eq(4*x-8*y,16)
eq6
```

[10]: $4x - 8y = 16$

[11]:
```
solve ([eq5,eq6], [x,y])
```

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

Oppgave 2b

[12]:
```
eq7=sp.Eq(x**2 - 4*x- 3,-3*y)
eq7
```

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

[14]:
```
Variable = 8
```

[15]:
```
eq8=sp.Eq(2*y,8-x)
eq8
```

[15]: $2y = 8 - x$

[16]:
```
solve ([eq7,eq8], [x,y])
```

[16]:
```
[(11/4 - sqrt(23)*I/4, 21/8 + sqrt(23)*I/8),
 (11/4 + sqrt(23)*I/4, 21/8 - sqrt(23)*I/8)]
```

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Oppgave 1a.

[17]:
```
eq1=sp.Eq(4*x + 2*y,12)
eq1
```

[17]: $4x + 2y = 12$

[18]:
```
eq2=sp.Eq(6*x - 2*y,8)
eq2
```

[18]: $6x - 2y = 8$

[19]:
```
solve ([eq1,eq2], [x,y])
```

[19]:
```
{x: 2, y: 2}
```

Oppgave 1b

[20]:
```
eq3=sp.Eq(2*x + y**2,25)
eq3
```

[20]: $2x + y^2 = 25$

[21]:
```
eq4=sp.Eq(x - 2*y,10)
eq4
```

[21]: $x - 2y = 10$

[22]:
```
solve ([eq3,eq4], [x,y])
```

[22]:
```
[(0, -5), (12, 1)]
```

Oppgave 2a

[23]:
```
eq5=sp.Eq(4*x - 4*y,8)
eq5
```

[23]: $4x - 4y = 8$

[24]:
```
eq6=sp.Eq(9*x - 5*y,26)
eq6
```

[24]: $9x - 5y = 26$

[25]:
```
solve ([eq5,eq6], [x,y])
```

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

Oppgave 2b

[26]:
```
eq7=sp.Eq(x - 2*y**2,15)
eq7
```

[26]: $x - 2y^2 = 15$

[27]:
```
eq8=sp.Eq(x**2 - 4*y**2,33)
eq8
```

[27]: $x^2 - 4y^2 = 33$

[28]:
```
solve ([eq7,eq8], [x,y])
```

[28]:
```
[(-1, -2*sqrt(2)*I), (-1, 2*sqrt(2)*I), (3, -sqrt(6)*I), (3, sqrt(6)*I)]
```

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Oppgave 1a

[29]:
```
import sympy as sy
from sympy import rootof
from sympy import root, Rational
from sympy import diff, sin, exp
```

[30]:
```
eq1=sp.Eq(x*y**2 - x,0)
eq1
```

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

[31]:
```
eq2=sp.Eq(x + y**2,16)
eq2
```

[31]: $x + y^2 = 16$

[32]:
```
solve ([eq1,eq2], [x,y])
```

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

Oppgave2b

[33]:
```
eq3=sp.Eq(x**2 + y**2,100)
eq3
```

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

[34]:
```
eq4=sp.Eq(x**2*y + 36*y,0)
eq4
```

[34]: $x^2y + 36y = 0$

[35]:
```
solve ([eq3,eq4], [x,y])
```

[35]:
```
[(-10, 0),
 (10, 0),
 (-I*sqrt(-10 + 2*sqrt(34))*sqrt(10 + 2*sqrt(34)), -2*sqrt(34)),
 (-I*sqrt(-10 + 2*sqrt(34))*sqrt(10 + 2*sqrt(34)), 2*sqrt(34)),
 (I*sqrt(-10 + 2*sqrt(34))*sqrt(10 + 2*sqrt(34)), -2*sqrt(34)),
 (I*sqrt(-10 + 2*sqrt(34))*sqrt(10 + 2*sqrt(34)), 2*sqrt(34))]
```

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[36]:
```
from sympy.tensor.array.array_derivatives import ArrayDerivative
```

[37]:
```
#Oppgave 1a
def f(x): return x**5
```

[38]:
```
x = sp.Symbol("x")
```

[39]:
```
sp.pprint(sp.diff(f(x), x))
```

```
   4
5 x
```

[40]:
```
#Oppgave 1b
def f(x): return x+12
```

[41]:
```
x = sp.Symbol("x")
```

[42]:
```
sp.pprint(sp.diff(f(x), x))
```

```
1
```

[43]:
```
#Oppgave 1c
def f(x): return x**3+4*x**2
```

[44]:
```
x = sp.Symbol("x")
```

[45]:
```
sp.pprint(sp.diff(f(x), x))
```

```
   2
3 x  + 8 x
```

[46]:
```
#Oppgave 1d
def f(x): return 2*x**3 + 36
```

[47]:
```
x = sp.Symbol("x")
```

[48]:
```
sp.pprint(sp.diff(f(x), x))
```

```
   2
6 x
```

[49]:
```
#Oppgave 1e
def f(x): return x + 5**2
```

[50]:
```
import math
```

[51]:
```
x = sp.Symbol("x")
```

[52]:
```
sp.pprint(sp.diff(f(x), x))
```

```
1
```

[53]:
```
#Oppgave 1f
def f(x): return x**3 + 1 / x
```

[54]:
```
x = sp.Symbol("x")
```

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

```
   2   1
3⋅x  - 
        2
       x
```

[56]:
```
#Oppgave 1g
def f(x): return x**3 - x**2 + 1 / 4 * x
```

[57]:
```
x = sp.Symbol("x")
```

[58]:
```
sp.pprint(sp.diff(f(x), x))
sp.simplify(sp.diff(f(x), x))
```

```
   2
3⋅x  - 2⋅x + 0.25
```

[58]:
$$3x^2 - 2x + 0.25$$

[59]:
```
#Oppgave 2a
def f(x): return 1 / x + 6*x**6
```

[60]:
```
x = sp.Symbol("x")
```

[61]:
```
sp.pprint(sp.diff(f(x), x))
```

```
    5   1
36⋅x  - 
         2
        x
```

[62]:
```
#Oppgave 2b
def f(x): return -x + 1 / 2 * x**3
```

[63]:
```
x = sp.Symbol("x")
```

[64]:
```
sp.pprint(sp.diff(f(x), x))
```

```
     2
1.5⋅x  - 1
```

[65]:
```
#Oppgave 2c
def f(x): return x(x**2+2*x-3)
```

[66]:
```
x = sp.Symbol("x")
```

[67]:
```
sp.pprint(sp.diff(f(x), x))
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
/tmp/ipykernel_41475/3975254386.py in <module>
----> 1 sp.pprint(sp.diff(f(x), x))

/tmp/ipykernel_41475/1131186432.py in f(x)
      1 #Oppgave 2c
----> 2 def f(x): return x(x**2+2*x-3)

TypeError: 'Symbol' object is not callable
```

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[68]:
```
def mysqrt(self, x: int) -> int:
    import math
    return int(math.sqrt(x))
    return int(x**(1/2))

from __future__ import division
from sympy import *
init_printing()

from sympy import sqrt, simplify, count_ops, oo
```

[69]:
```
import sympy as sp
import numpy as np
import matplotlib.pyplot as plt
from sympy.solvers import solve
from sympy import *

x,y = sp.symbols('x y')
```

[70]:
```
#Oppgave 1a
```

[71]:
```
def f(x): return x**3 + 6*x**5
```

[72]:
```
x = sp.Symbol("x")
sp.pprint(sp.diff(f(x), x))
```

```
   4      2
30⋅x  + 3⋅x
```

[73]:
```
#Oppgave 1b
```

[74]:
```
import sympy as sp

x=sp.Symbol('x')
```

[75]:
```
ur = sp.diff(sp.sqrt(2*x**2+5))
simplify(ur)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[75]:
$$\frac{2x}{\sqrt{2x^2+5}}$$

Oppgave 1c

[76]:
```
ir = sp.diff((2*x)/(x**2+3)**4)
simplify(ir)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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```
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[76]:
$$\frac{2\left(3-7x^2\right)}{\left(x^2+3\right)^5}$$

oppgave 1d

[77]:
```
ie = sp.diff((2*x**4 + 9)**3/2)
simplify(ie)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[77]:
$$12x^3\left(2x^4+9\right)^2$$

Oppgave 1e

[78]:
```
sp.diff(sp.sqrt(1+x**2)**1/2)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[78]:
$$\frac{x}{2\sqrt{x^2+1}}$$

Oppgave 1f

[79]:
```
p =sp.diff (x**2*(x**2+2*x)**3)
simplify(p)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[79]:
$$x^4\,(x+2)^2\,(8x+10)$$

Oppgave 1g

[80]:
```
q = sp.diff(sp.sqrt (x**2) * (x**2-2*x))
simplify(q)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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```

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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[80]:

$$(3x-4)\sqrt{x^2}$$

[81]:
```
okk=sp.diff(x**2 *sp.sqrt(x**2-2*x))
simplify(okk)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[81]:

$$\frac{x^2\,(3x-5)}{\sqrt{x\,(x-2)}}$$

Oppgave 1h

[82]:
```
sp.diff(x**2 / (x**2+x**3)**1/2)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The MathtextBackendBitmap class was deprecated in Matplotlib 3.4 and will be
removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[82]:
$$\frac{x^2\left(-3x^2-2x\right)}{2\left(x^3+x^2\right)^2}+\frac{x}{x^3+x^2}$$

Oppgave 1i

[83]:
```
ag = sp.diff((x**2 + 1)**2 * (x**3+1)**3)
simplify(ag)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

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

6 Oppgave 2

[84]:
```
#Oppgave 2a.
sp.diff(sp.sqrt(3*x**2 + 2*x)**4)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[84]: $(12x+4)\left(3x^2+2x\right)$

[85]:
```
#Oppgave 2b.
sp.diff(x**3+3**5 * x**2+3)**4
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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The to_mask function was deprecated in Matplotlib 3.4 and will be removed two
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[85]:
$$\left(3x^2 + 486x\right)^4$$

[86]:
```
#oppgave 1c
sp.diff(sp.sqrt(x**2+1*x**2))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[86]:
$$\frac{\sqrt{2}\sqrt{x^2}}{x}$$

[87]:
```
#Oppgave 2d
sp.diff( (2*x + 3*x**2)**2 / x ** 2)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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```
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[87]:
$$\frac{(12x+4)\left(3x^2+2x\right)}{x^2} - \frac{2\left(3x^2+2x\right)^2}{x^3}$$

[88]:
```
#Oppgave 2e
sp.diff(sp.sqrt(3/x**4 - 5))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[88]:
$$-\frac{6}{x^5\sqrt{-5+\frac{3}{x^4}}}$$

[89]:
```
#Oppgave 2f
ruue = sp.diff(x**3 / sp.sqrt(x**4 - 1))
simplify(ruue)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[89]:
$$\frac{x^2\left(x^4-3\right)}{\left(x^4-1\right)^{\frac{3}{2}}}$$

7 Likningsett 22

[90]:
```
#Oppgave 1a.
```

[91]:
```
def f(x): return
```

[92]:
```
sp.diff(log(5*x))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[92]:
$$\frac{1}{x}$$

[93]:
```
#Oppgave 1b.
```

[94]:
```
sp.diff(sp.exp(-2*x))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[94]:
$$-2e^{-2x}$$

[95]:
```
#Oppgave 1c.
sp.diff(log(12*x)-3)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The MathtextBackendBitmap class was deprecated in Matplotlib 3.4 and will be
removed two minor releases later. Use mathtext.math_to_image instead.
```

```
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

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

[96]:
```
#Oppgave 1d.
sp.diff(2**x)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[96]: $2^x \log(2)$

[97]:
```
#Oppgave 1e.
```

[98]:
```
sp.diff(sp.exp(3*x+5))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

```
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[98]:
$$3e^{3x+5}$$

[99]:
```
#Oppgave 1f.
sp.diff(sp.log(x**5+1))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[99]:
$$\frac{5x^4}{x^5+1}$$

[100]:
```
#Oppgave 1g.
sp.diff(sp.exp(4*x**2+8**x))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
```

```
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[100]:
$$\left(8^{x}\log\left(8\right)+8x\right)e^{8^{x}+4x^{2}}$$

[101]:
```
#Oppgave 1h.
sp.diff(sp.log(1 / x))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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The MathtextBackendBitmap class was deprecated in Matplotlib 3.4 and will be
removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[101]:
$$-\frac{1}{x}$$

[102]:
```
#Oppgave 1i.
sp.diff(sp.log(6*x + 3 * sp.exp(4*x)
```

```
  File "/tmp/ipykernel_41475/2662702746.py", line 2
    sp.diff(sp.log(6*x + 3 * sp.exp(4*x)
                                        ^
SyntaxError: unexpected EOF while parsing
```

[103]:
```
#Oppgave 1j.
sp.diff(x * sp.exp(-x))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[103]:
$$-xe^{-x} + e^{-x}$$

[104]:
```
#Oppgave 1k.
sp.diff(x**2 * sp.log(x**2+2))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[104]:
$$\frac{2x^3}{x^2+2} + 2x\log\left(x^2+2\right)$$

[105]:
```
# Oppgave 2a.
rp = sp.diff(x**3 * sp.exp(2*x))
simplify(rp)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
The to_png function was deprecated in Matplotlib 3.4 and will be removed two
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[105]:
$$x^2\left(2x+3\right)e^{2x}$$

[106]:
```
#Oppgave 2b.
kr = sp.diff(sp.log( x**2- 1 / x**2 - 1 ))
simplify(kr)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

```
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[106]:
$$\frac{2x^4 + 2}{x^5 - x^3 - x}$$

[107]:
```
#Oppgave 2c
sp.diff(x**2 * sp.log(x**2 + 2))
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
packages/IPython/lib/latextools.py:126: MatplotlibDeprecationWarning:
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removed two minor releases later. Use mathtext.math_to_image instead.
  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[107]:
$$\frac{2x^3}{x^2 + 2} + 2x \log\left(x^2 + 2\right)$$

[108]:
```
#Oppgave 2d.
sp.diff(sp.exp(-x) / x**2 + 1)
```

```
/usr/local/Miniconda3-py39_4.9.2-Linux-x86_64/lib/python3.9/site-
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```

```
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  mt.to_png(f, s, fontsize=12, dpi=dpi, color=color)
```

[108]:
$$-\frac{e^{-x}}{x^2} - \frac{2e^{-x}}{x^3}$$

[ ]:

[ ]: