

Oving2_matte4

September 19, 2021

```
[1]: %matplotlib inline
from numpy import *
from matplotlib.pyplot import *
from math import factorial
import matplotlib.pyplot as plt
newparams = {'figure.figsize': (8.0, 4.0), 'axes.grid': True,
'lines.markersize': 8, 'lines.linewidth': 2,
'font.size': 14}
plt.rcParams.update(newparams)
```

```
[9]: # composite simpsons rule
def CSR(function, a, b, n):
    h = (b-a)/n
    x = linspace(a, b, n+1)
    result = 0
    for i in range(1, n+1):
        result += function(x[i-1]) + 4*function((x[i-1] + x[i])/2) +
        ↪function(x[i])
    result = result * h/6
    return result
```

```
[3]: def f(x):
    return tan((pi/4)*x)
```

```
[13]: for i in range(2, 7):
    m = 2**i
    print("m =", m, ":", CSR(f, 0, 1, m))
```

```
m = 4 : 0.441280049596664
m = 8 : 0.4412717695321729
m = 16 : 0.44127123615003055
m = 32 : 0.4412712025498551
m = 64 : 0.4412712004456543
```

```
[23]: answer = 2 * log(2)/pi
errors = []
steps = []
```

```

tabulate = []

for i in range(2, 7):
    m = 2**i
    h = 2**(-i)
    steps.append(h)
    errors.append(abs(answer - CSR(f, 0, 1, m)))
    row = [h, m, errors[i-2]]
    tabulate.append(row)

print(tabulate)

```

```

[[0.25, 4, 8.849291360801814e-06], [0.125, 8, 5.692268696955161e-07], [0.0625,
16, 3.5844727352962735e-08], [0.03125, 32, 2.2445518776947893e-09], [0.015625,
64, 1.4035111961518965e-10]]

```

```

[32]: plt.title("Composite Simpons Rule errors")
plt.xlabel("Errors")
plt.ylabel("h")
plt.plot(errors, steps)
plt.loglog(basex=2, basey=2)
plt.show()

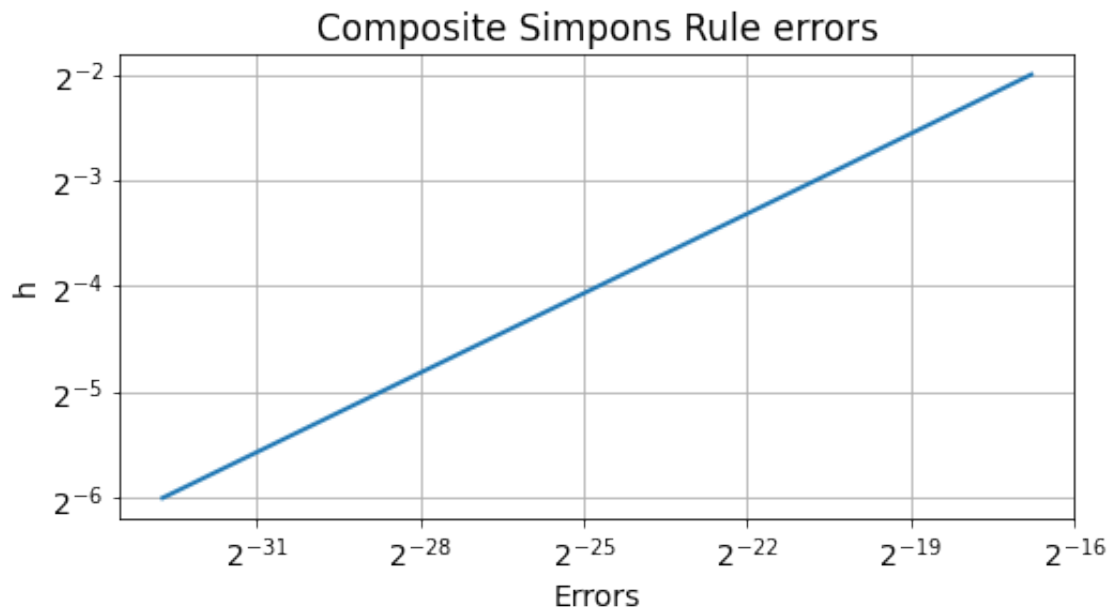
```

/tmp/ipykernel_161719/2022188119.py:5: MatplotlibDeprecationWarning: The 'basex' parameter of `__init__()` has been renamed 'base' since Matplotlib 3.3; support for the old name will be dropped two minor releases later.

```
plt.loglog(basex=2, basey=2)
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/tmp/ipykernel_161719/2022188119.py:5: MatplotlibDeprecationWarning: The 'basey' parameter of `__init__()` has been renamed 'base' since Matplotlib 3.3; support for the old name will be dropped two minor releases later.

```
plt.loglog(basex=2, basey=2)
```



$\log_2 - \log_2$ plottet har ca stigningstall 4, som tyder på at konvergensen er av grad 4

```
[41]: def g(x):
      return sqrt(1-x**2)
```

```
[43]: for i in range(2, 7):
      m = 2**i
      print("m =", m, ":", CSR(g, 0, 1, m))
```

```
m = 4 : 0.7802972924438545
m = 8 : 0.7835994172461493
m = 16 : 0.7847630544733984
m = 32 : 0.7851737690201337
m = 64 : 0.7853188547338977
```

```
[47]: answer = pi/4
      errors = []
      steps = []
      tabulate = []

      for i in range(2, 7):
          m = 2**i
          h = 2**(-i)
          steps.append(h)
          errors.append(abs(answer - CSR(g, 0, 1, m)))
          row = [h, m, errors[i-2]]
          tabulate.append(row)
```

```
print(tabulate)
```

```
[[0.25, 4, 0.005100870953593795], [0.125, 8, 0.0017987461512989356], [0.0625, 16, 0.000635108924049832], [0.03125, 32, 0.00022439437731458511], [0.015625, 64, 7.9308663550548e-05]]
```

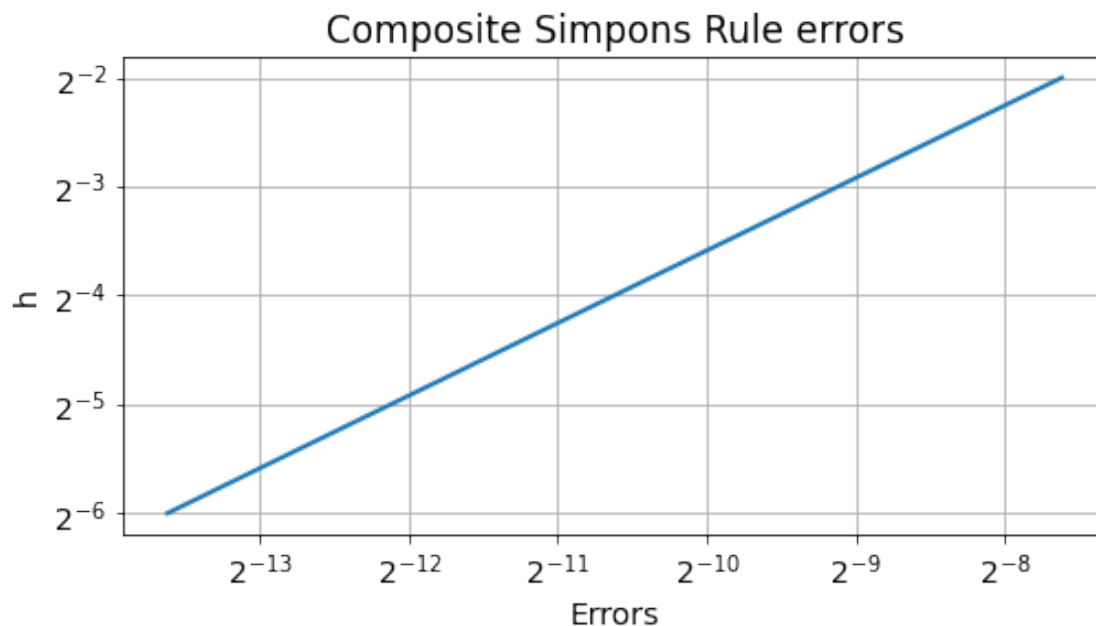
```
[48]: plt.title("Composite Simpsons Rule errors")
plt.xlabel("Errors")
plt.ylabel("h")
plt.plot(errors, steps)
plt.loglog(basex=2, basey=2)
plt.show()
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/tmp/ipykernel_161719/2022188119.py:5: MatplotlibDeprecationWarning: The 'basex' parameter of `__init__()` has been renamed 'base' since Matplotlib 3.3; support for the old name will be dropped two minor releases later.

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plt.loglog(basex=2, basey=2)
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/tmp/ipykernel_161719/2022188119.py:5: MatplotlibDeprecationWarning: The 'basey' parameter of `__init__()` has been renamed 'base' since Matplotlib 3.3; support for the old name will be dropped two minor releases later.

```
plt.loglog(basex=2, basey=2)
```



Stigningstallet er mye lavere enn i b). Dette kommer nok av at i nærheten av 1 går den deriverte av funksjonen mot uendelig.

```
[ ]:
```

[]: