

forelesning6

October 29, 2025

1 Forelesning 6: Numerisk integrasjon

1.1 Det bestemte integralet

```
[37]: def f(x):  
        return x      # Integrert = 0.5x**2  
  
a = 0 # Startpunkt  
b = 2 # Sluttpunkt  
A = 0 # Areal  
N = 100000000 # Antall rektangler  
dx = (b - a)/N # Bredden på rektanglene  
  
x = a  
for i in range(N):  
    A = A + f(x)*dx # A = høyde x bredde  
    x = x + dx  
  
print(A)
```

1.9999999818801717

```
[ ]: def f(x):  
        return x  
  
def integrate(f, a, b, N):  
    dx = (b - a) / N # Bredden på rektanglene  
    A = 0 # Areal  
    x = a  
  
    for i in range(N):  
        A += f(x) * dx # A = høyde * bredde  
        x += dx  
  
    return A  
  
resultat = integrate(f, 0, 2, 1000)  
print(resultat)
```

```
[ ]: def venstretilnærmning(f, a, b, N = 100000):
    dx = (b - a)/N
    x = a
    A = 0
    for i in range(N):
        A = A + f(x)*dx
        x = x + dx
    return A
```

```
[39]: def høyretilnærmning(f, a, b, N = 100000):
    dx = (b - a)/N
    x = a + dx
    A = 0
    for i in range(N):
        A = A + f(x)*dx
        x = x + dx
    return A
```

```
[40]: høyretilnærmning(f, 0, 2)
```

```
[40]: 2.0000199999987003
```

```
[43]: def midtpunktstilnærmning(f, a, b, N = 100000):
    dx = (b - a)/N
    x = a + dx/2
    A = 0
    for i in range(N):
        A = A + f(x)
        x = x + dx
    return A*dx
```

```
[44]: midtpunktstilnærmning(f, 0, 2)
```

```
[44]: 1.9999999999987004
```

1.2 Andre tilnærminger

```
[47]: def trapesmetoden(f, a, b, N = 100000):
    dx = (b - a)/N
    x = a + dx
    A = 0
    for i in range(1,N):
        A = A + f(x)
        x = x + dx
    return (A + (f(a) + f(b))/2)*dx
```

```
trapesmetoden(f, 0, 2)
```

```
[47]: 1.9999999999987024
```

1.3 Bruke biblioteksfunksjoner til å integrere

Benytter scipy-biblioteket.

```
[65]: from scipy.integrate import trapezoid, simpson, quad
import numpy as np
```

```
[51]: x = np.linspace(a,b,100000)
y = f(x)
```

```
[52]: trapesmetoden = trapezoid(y,x)
trapesmetoden
```

```
[52]: 2.0
```

```
[58]: simpsons = simpson(y,x)
simpsons
```

```
/var/folders/z_/zd2_19g1205dvcvdhgk10p680000gp/T/ipykernel_88515/2046446227.py:1
: DeprecationWarning: You are passing x=[0.00000e+00 2.00002e-05 4.00004e-05 ...
1.99996e+00 1.99998e+00
2.00000e+00] as a positional argument. Please change your invocation to use
keyword arguments. From SciPy 1.14, passing these as positional arguments will
result in an error.
simpsons = simpson(y,x)
```

```
[58]: 2.0000000000000004
```

```
[66]: quad(f, a, b)
```

```
[66]: (2.0, 2.220446049250313e-14)
```

```
[ ]:
```