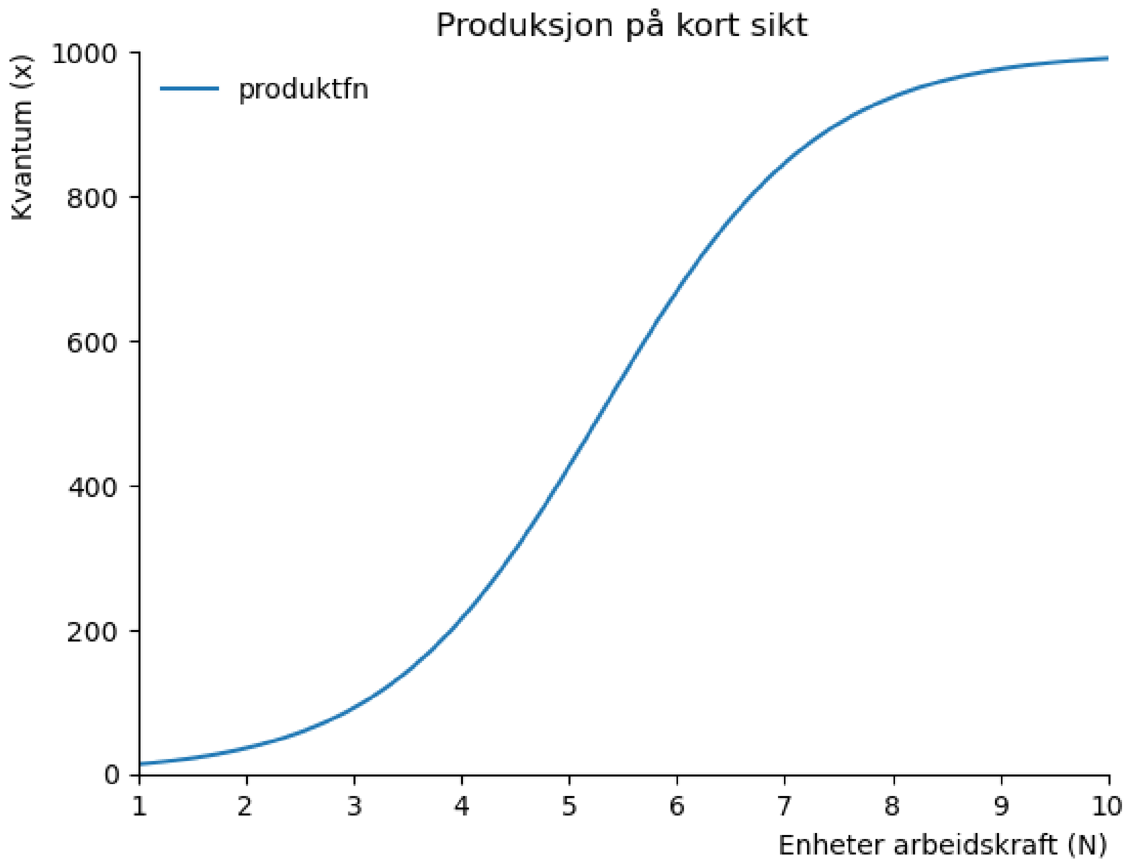
In [1]:
```
# importer pakkene som vi trenger
import numpy as np
from matplotlib import pyplot as plt
import sympy as sp
```

In [2]:
```
# definer symboler
N, A = sp.symbols('N A', positive=True, real=True)
```

In [3]:
```
# Vi definerer produktfn

def prod(c,N,A):
    produksjon=1000*(c.exp(N)/(A+c.exp(N)))
    return produksjon
prod(sp,N,A)
```

Out[3]: $\displaystyle \frac{1000 e^{N}}{A + e^{N}}$

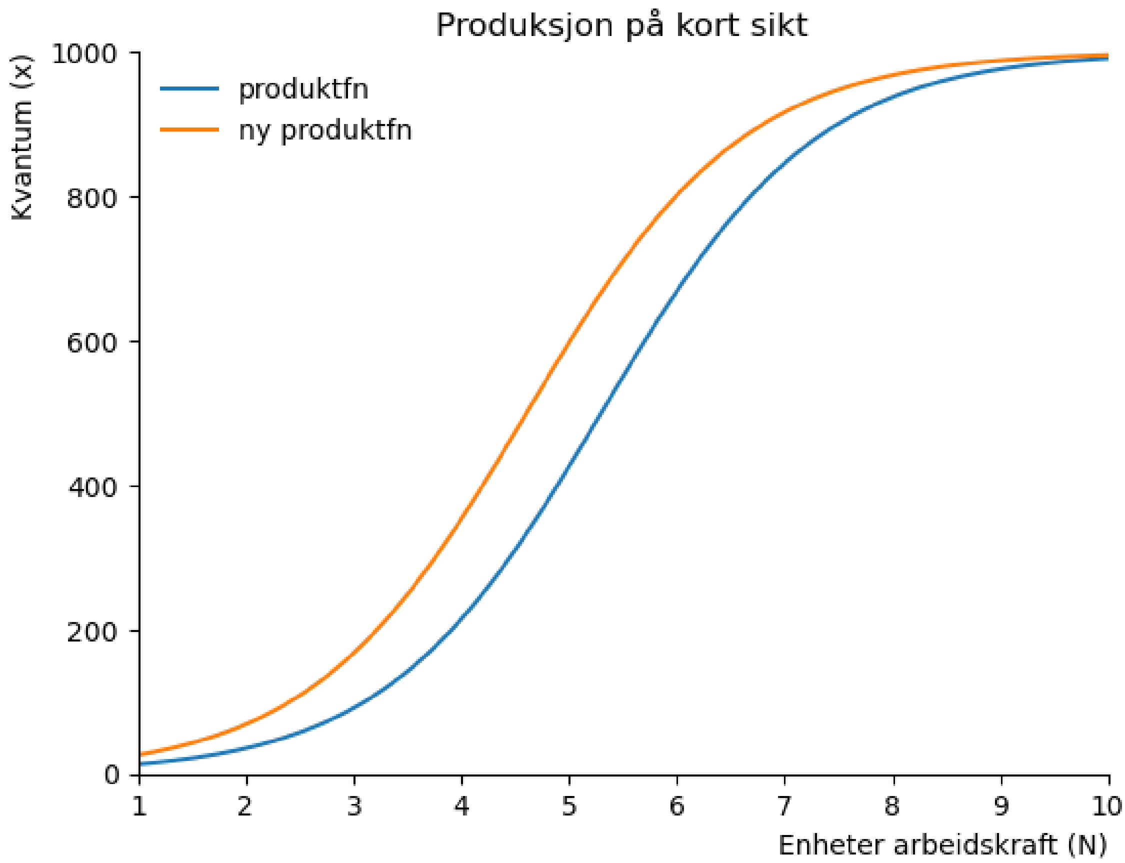
In [4]:
```
n=np.linspace(1,10,100)

fig1, ax = plt.subplots()
ax.set_ylabel('Kvantum (x)', loc='top')
ax.set_xlabel('Enheter arbeidskraft (N)', loc='right')
ax.set(xlim=(1,10))
ax.set(ylim=(0,1000))
ax.spines['top'].set_color('none')
ax.spines['right'].set_color('none')


# plott funksjonen

ax.plot(n, prod(np,n,200), label='produktfn')


# tittel
ax.set_title('Produksjon på kort sikt')

#vis navnene:
ax.legend(loc='best',frameon=False);
```



In [ ]:
```
# skriv ditt svar her
l = sp.simplify(sp.diff(prod(sp,N,200),N))
display(l)

l2 = sp.lambdify((N), l)
```

In [6]:
```
ax.plot(n, prod(np,n,100), label='ny produktfn')
ax.legend(loc='best',frameon=False)
fig1
```

Out[6]:



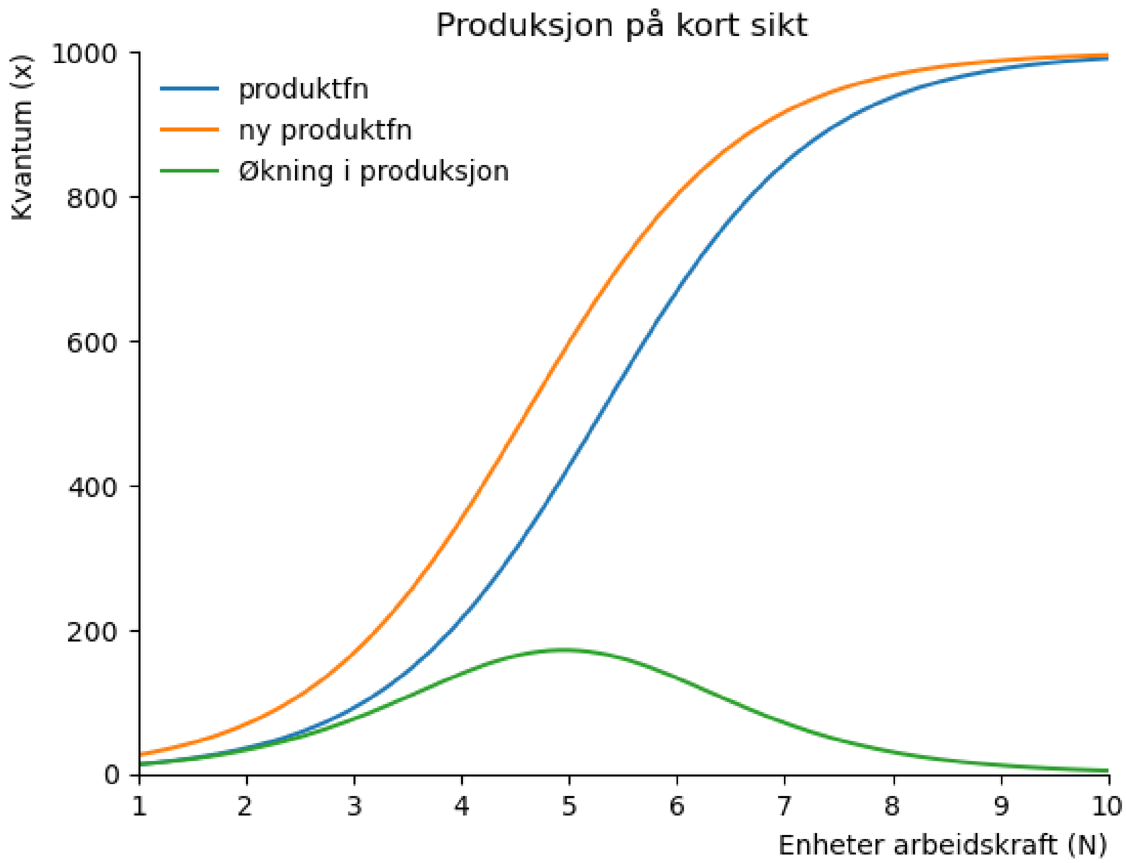
In [5]:

```
# økning i produksjon fra å ta i bruk den nye teknologien
def increase(c,N):
    return (prod(c,N,100)-prod(c,N,200))
```

In [7]:

```
ax.plot(n, increase(np,n), label='Økning i produksjon')
ax.legend(loc='best',frameon=False)
fig1
```

Out[7]:



In [8]:
```
increase_d=sp.simplify(sp.diff(increase(sp,N),N))
increase_d
```

Out[8]: $\displaystyle \frac{100000 \cdot \left(20000 - e^{2 N}\right) e^{N}}{e^{4 N} + 600 e^{3 N} + 130000 e^{2 N} + 12000000 e^{N} + 400000000}$

In [9]:
```
sol=sp.solve(increase_d,N)[0]
sol
# dette gir N som maksimerer produksjonssøkningen
```

Out[9]: $\displaystyle \log{\left(100 \sqrt{2} \right)}$

In [10]:
```
float(sol)
```

Out[10]: 4.951743776268064

In [11]:
```
increase(sp,float(sol))
```

Out[11]: $\displaystyle 171.57287525381$