

```
In [2]: import numpy as np
from matplotlib import pyplot as plt
import sympy as sp
```

```
In [3]: # Etterspørsel

def x_d(p):
    return 500 - 3.2*p

#Tilbud

def x_s(p,t):
    return -100+4.3*(p-t)
```

```
In [4]: # definer symboler i sympy

x,p,t = sp.symbols('x p t', positive=True, real=True)

# betingelse for likevekt

equ=sp.Eq(x_d(p), x_s(p,t))
equ
```

Out[4]:
$$500 - 3.2 p = 4.3 p - 4.3 t - 100$$

```
In [8]: eq_d = sp.Eq(500-3.2*p,x)
eq_p = sp.solve(eq_d,p)
display(eq_p)
eq_s = sp.Eq(-100 + 4.3*(p-t),x)
eq_p = sp.solve(eq_s,p)
display(eq_p)

[156.25 - 0.3125*x]
[t + 0.232558139534884*x + 23.2558139534884]
```

```
In [10]: def x_a(x):
    return 156.25 - 0.3125*x

def x_l(x,t):
    return t + 0.232558139534884*x + 23.2558139534884
```

```
In [14]: #likevektspris.
p_eq = sp.solve(equ,p)
p_eq
p_eq = 80
display(p_eq)
```

80

```
In [15]: #likevektskvantum.
x_eq=x_d(p_eq)
x_eq
x_eq = 244
x_eq
```

Out[15]: 244

```
In [16]: # med avgift
lig2=sp.Eq(x_d(p), x_s(p,4))
```

```
In [33]: # Likevektpriis med avgift
p_eq2 = sp.solve(lig2,p)
p_eq2 = float(p_eq2[0])
display(round(p_eq2,2))
```

82.29

```
In [34]: # Likevektskvantum med avgift
x_eq2= x_d(p_eq2)
x_eq2 = float(x_eq2)
round(x_eq2,2)
```

Out[34]: 236.66

```
In [41]: # produsentoverskudd
producer_surplus=sp.integrate(p_eq-x_l(x,0),(x,0,x_eq))
display(round(producer_surplus,2))

# produsentoverskudd
producer_surplus_4=sp.integrate(p_eq2-x_l(x,4),(x,0,x_eq2))
display(round(producer_surplus_4,2))
```

 $\$ \text{displaystyle } 6898.39 \$$ $\$ \text{displaystyle } 6488.96 \$$

```
In [61]: from IPython.display import Markdown
```

```
tbl=f"""
| Før avgift | | Etter avgift |
| :----- | :-----: | :----- |
| Konsumentpris: | {np.round(p_k_mva,2)} | |
| Produsentpris: | | |
| Kvantum: | {np.round(x_mva,2)} | |
| Konsumentoverskudd: | ${np.round(float(consumer_surplus),2)}$ | |
| Produsentoverskudd: | ${np.round(float(producer_surplus),2)}$ | |
| KO + PO: | | |
| Skatteproveny: | | |
| Dødvektstap: | | |
"""
display(Markdown(tbl))
```

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Cell In[61], line 17
display(Markdown(tbl))
```

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SyntaxError: invalid syntax
```