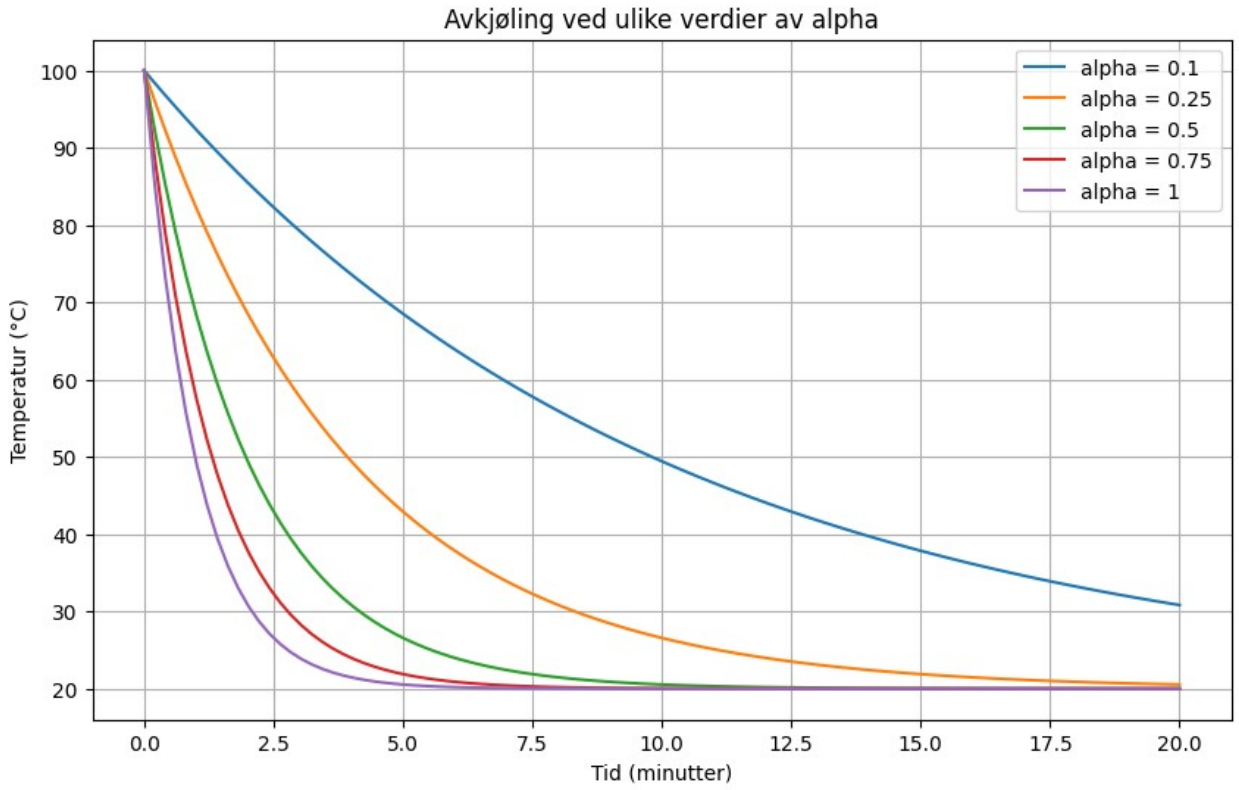
OBLIG 1 - TMA4101

Teori

Graf av T(t) ved forskjellig alpha verdier.

```
import numpy as np
import matplotlib.pyplot as plt

# Definer starttemperaturen, omgivelsestemperaturen og tidsskalaen
T0 = 100    # grader Celsius
TK = 20
tid = np.linspace(0, 20, 100)  # Tid,  0 til 20 minutter

# alpha
alpha_verdier = [0.1, 0.25, 0.5, 0.75, 1]

# Plotting av funksjonen T(t) for ulike alpha verdier
plt.figure(figsize=(10, 6))

for alpha in alpha_verdier:
    T = TK + (T0 - TK) * np.exp(-alpha * tid)
    plt.plot(tid, T, label=f'alpha = {alpha}')

plt.title('Avkjøling ved ulike verdier av alpha')
plt.xlabel('Tid (minutter)')
plt.ylabel('Temperatur (°C)')
plt.grid(True)
plt.legend()
plt.show()
```



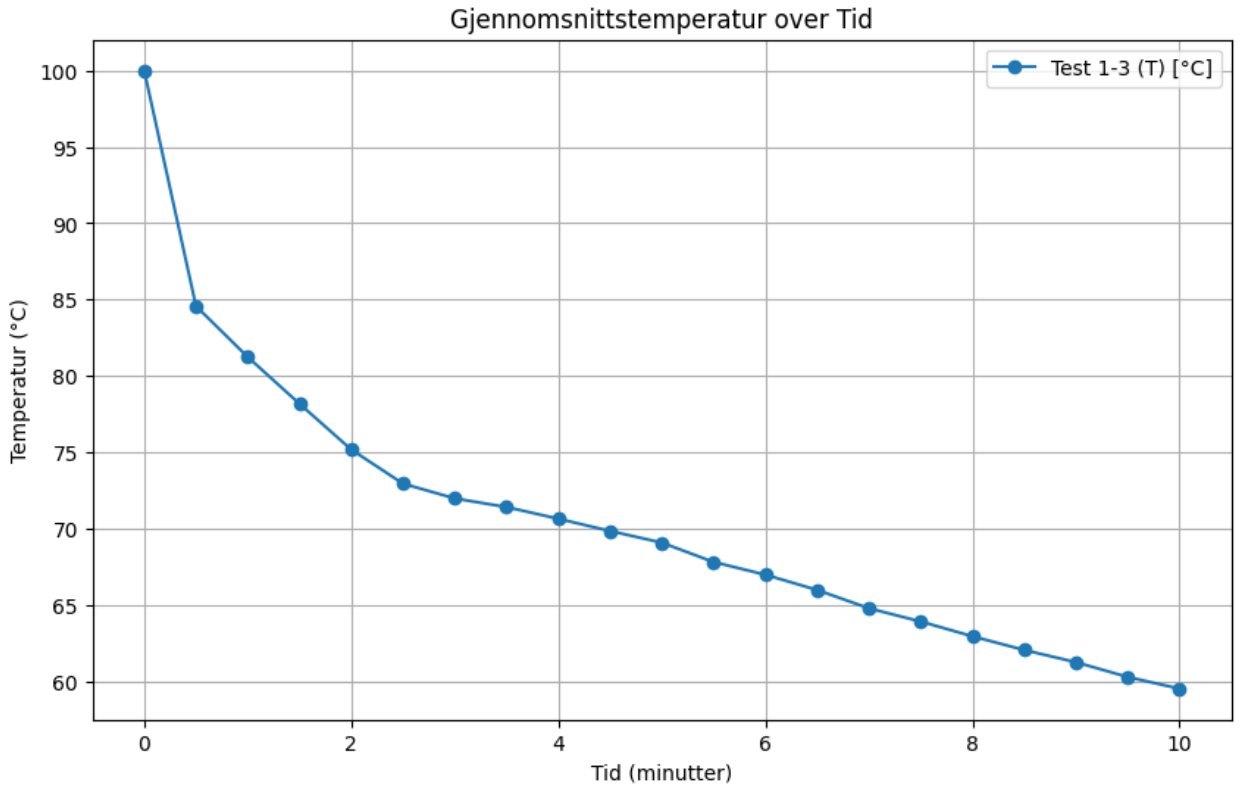
Testing

Testresultatene av test 1-3

-------	Test 1 (T) [°C]	Test 2 (T) [°C]	Test 3 (T) [°C]
Romtemperatur T_K	23.5	23.3	23.5
Tid (Minutter)	Test 1 (T) [°C]	Test 2 (T) [°C]	Test 3 (T) [°C]
0	100.0	100.0	100.0
0.5	85.1	84.5	84.1
1	81.2	80.7	81.8
1.5	78.5	77.4	78.6
2	75.4	74.6	75.5
2.5	72.4	72.9	73.5
3	71.3	71.8	72.8
3.5	70.5	71.6	72.1
4	69.9	70.9	71.1
4.5	69.0	69.9	70.6
5	68.2	69.0	70.0
5.5	67.3	68.0	68.1
6	66.3	67.0	67.6

-------	Test 1 (T) [°C]	Test 2 (T) [°C]	Test 3 (T) [°C]
6.5	65.2	66.1	66.6
7	64.4	64.7	65.2
7.5	63.5	63.9	64.3
8	62.4	63.1	63.3
8.5	61.5	62.1	62.5
9	60.9	61.2	61.6
9.5	59.7	60.3	60.8
10	59.0	59.5	60.0

```
tid = np.array([0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6,
6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10])
t_K = [23.5, 23.3, 23.5]

test1 = [100.0, 85.1, 81.2, 78.5, 75.4, 72.4, 71.3, 70.5, 69.9, 69.0,
68.2, 67.3, 66.3, 65.2, 64.4, 63.5, 62.4, 61.5, 60.9, 59.7, 59.0]
test2 = [100.0, 84.5, 80.7, 77.4, 74.6, 72.9, 71.8, 71.6, 70.9, 69.9,
69.0, 68.0, 67.0, 66.1, 64.7, 63.9, 63.1, 62.1, 61.2, 60.3, 59.5]
test3 = [100.0, 84.1, 81.8, 78.6, 75.5, 73.5, 72.8, 72.1, 71.1, 70.6,
70.0, 68.1, 67.6, 66.6, 65.2, 64.3, 63.3, 62.5, 61.6, 60.8, 60.0]

plt.figure(figsize=(10, 6))
gen_T_K = np.mean(t_K)
gjennomsnitts_temp = np.mean([test1, test2, test3], axis=0)
plt.plot(tid, gjennomsnitts_temp, marker='o', linestyle='-',
label='Test 1-3 (T) [°C]')


plt.title('Gjennomsnittstemperatur over Tid')
plt.xlabel('Tid (minutter)')
plt.ylabel('Temperatur (°C)')
plt.legend()
plt.grid(True)
plt.show()

print(gen_T_K)
print(gjennomsnitts_temp)
```




```
23.433333333333334
[100.          84.56666667  81.23333333  78.16666667  75.16666667
  72.93333333  71.96666667  71.4         70.63333333  69.83333333
  69.06666667  67.8         66.96666667  65.96666667  64.76666667
  63.9         62.93333333  62.03333333  61.23333333  60.26666667
  59.5       ]
```

Kalkulerer alpha for hvert punkt og plotte simulert og test graf.

```
alpha = - (1 / tid[1:]) * np.log((gjennomsnitts_temp[1:] - gen_T_K) /
(100 - gen_T_K))

print(alpha)
gen_alpha = np.mean(alpha)
print(gen_alpha)

T0 = 100
TK = gen_T_K

T = TK + (T0 - TK) * np.exp(- gen_alpha * tid)
plt.plot(tid, T, label=f'alpha = {gen_alpha}')
plt.plot(tid, gjennomsnitts_temp, marker='o', linestyle='-',
label='Test 1-3 (T) [°C]')
plt.title('Temperatur over Tid')
```

```
plt.xlabel('Tid (minutter)')
plt.ylabel('Temperatur (°C)')
plt.legend()
plt.grid(True)
plt.show()
```

```
[0.4502091  0.28117305 0.22379261 0.19602975 0.17447566 0.15197032
 0.13361586 0.12094198 0.11130275 0.10350468 0.09921334 0.09410582
 0.09044211 0.08807036 0.08502443 0.08273264 0.08057759 0.07842808
 0.07702722 0.07527927]
0.1398958313730064
```