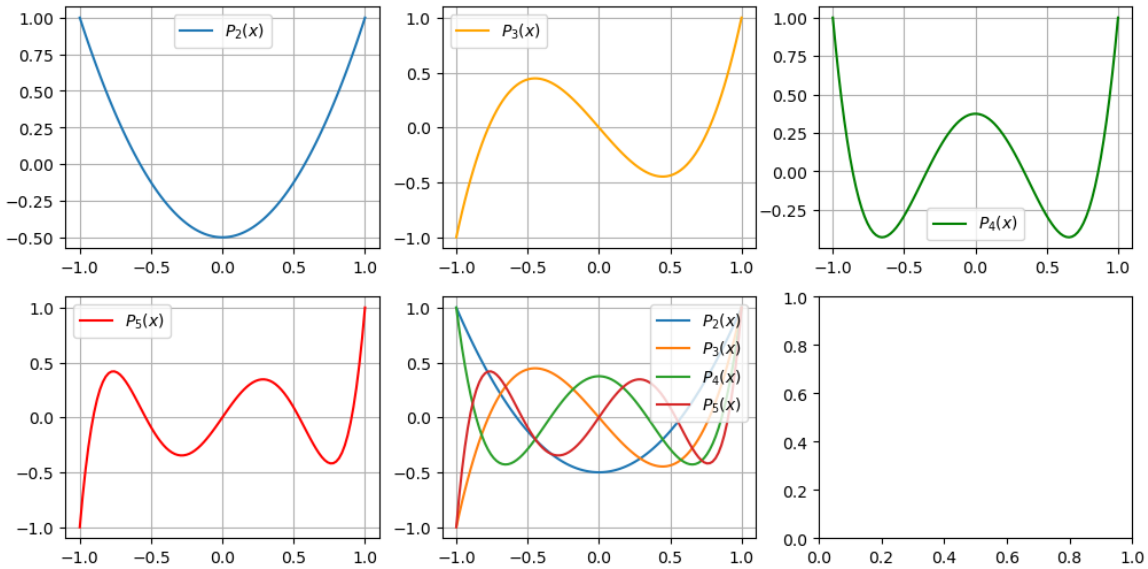
Sem 3 Exam - Python Questions

Question 2

Try to it by calculations.

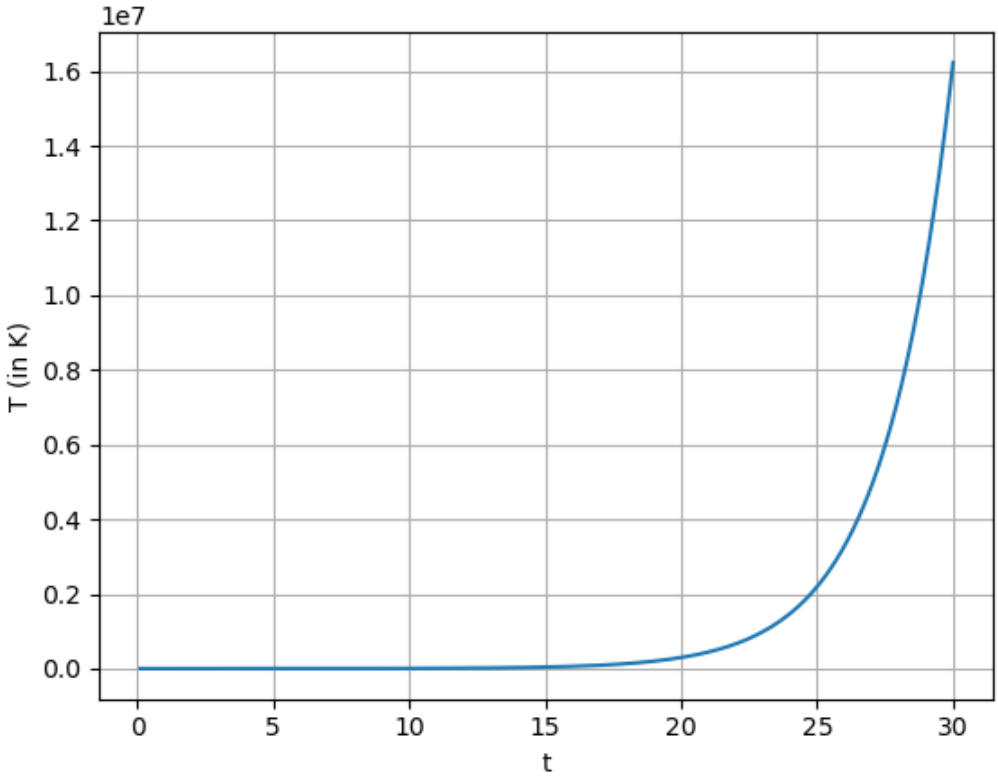
In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
from scipy.special import legendre as P

x = np.linspace(-1,1,100)

P2 = P(2)(x)  # Legendre polynomial of degree 2
P3 = P(3)(x)  # Legendre polynomial of degree 3
P4 = P(4)(x)  # Legendre polynomial of degree 4
P5 = P(5)(x)  # Legendre polynomial of degree 5

fig, axes = plt.subplots(2,3, figsize=(12,6))
ax1 = axes[0][0]
ax1.plot(x,P2, label='$P_2(x)$')
ax1.legend()
ax1.grid()
ax2 = axes[0][1]
ax2.plot(x,P3, 'orange', label='$P_3(x)$')
ax2.legend()
ax2.grid()
ax3 = axes[0][2]
ax3.plot(x,P4, 'green', label='$P_4(x)$')
ax3.legend()
ax3.grid()
ax4 = axes[1][0]
ax4.plot(x,P5, 'red', label='$P_5(x)$')
ax4.legend()
ax4.grid()
ax5 = axes[1][1]
ax5.plot(x,P2, label='$P_2(x)$')
ax5.plot(x,P3, label='$P_3(x)$')
ax5.plot(x,P4, label='$P_4(x)$')
ax5.plot(x,P5, label='$P_5(x)$')
ax5.legend()
ax5.grid()
plt.show()
```



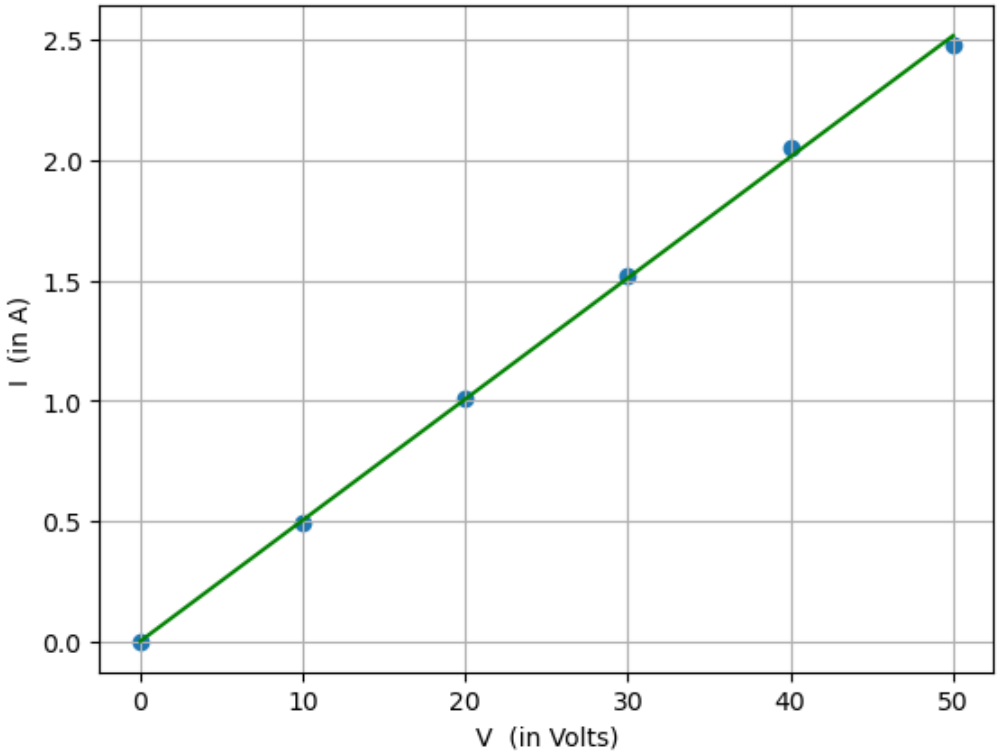
Question 3

In [2]:
```
import matplotlib.pyplot as plt

def dTdt(t,T):
    return a * (T - T0)

dt = 0.1
tt, TT = [], []
a = 0.4        # given value of the parameter a
T0 = 273       # given value of the parameter T0
t, T = 0, 373    # Initial Condition

for i in range(300):
    t = t + dt
    dTdt1 = 0.5*(dTdt(t,T) + dTdt(t + dt, T + dt * dTdt(t,T)))
    T = T + dTdt1*dt
    tt.append(t), TT.append(T)

plt.plot(tt, TT)
plt.xlabel('t')
plt.ylabel('T (in K)')
plt.grid()
plt.show()
```



Question 5

In [3]:
```
import matplotlib.pyplot as plt

x = [0,10,20,30,40,50]            # data of voltages (in volts)
y = [0,0.49,1.01,1.52,2.05,2.48]  # data of currents (in A)

yfit = []
n = len(x)

xav = sum(x)/n
yav = sum(y)/n
Sxy = sum((i-xav)*(j-yav) for i,j in zip(x,y))
Sxx = sum((i-xav)**2 for i in x)

a1 = Sxy/Sxx
a0 = yav - a1*xav
yfit = [a0 + a1*i for i in x]   # desired straight line

plt.scatter(x,y)
plt.plot(x, yfit, color='green')
plt.xlabel('V  (in Volts)')
plt.ylabel('I  (in A)')
plt.grid()
plt.show()

print('slope = I/V =', a1)
print('y intercept =', a0)
print('Resistance is, \t R = V/I = 1/(slope) =', 1/a1, 'Ohm.')
```




```
slope = I/V = 0.05025714285714285
y intercept = 0.0019047619047622977
Resistance is,    R = V/I = 1/(slope) = 19.89766913018761 Ohm.
```

In [ ]: