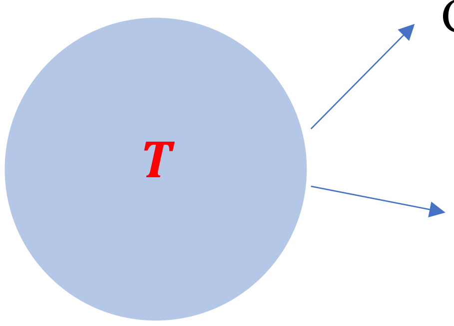
Simulation d'examen python

Comparer le refroidissement d'une sphère par rayonnement et par convection par l'intersection de courbes.

T_∞



Convection

$$\Phi_{conv} = h * (T - T_\infty) * S$$

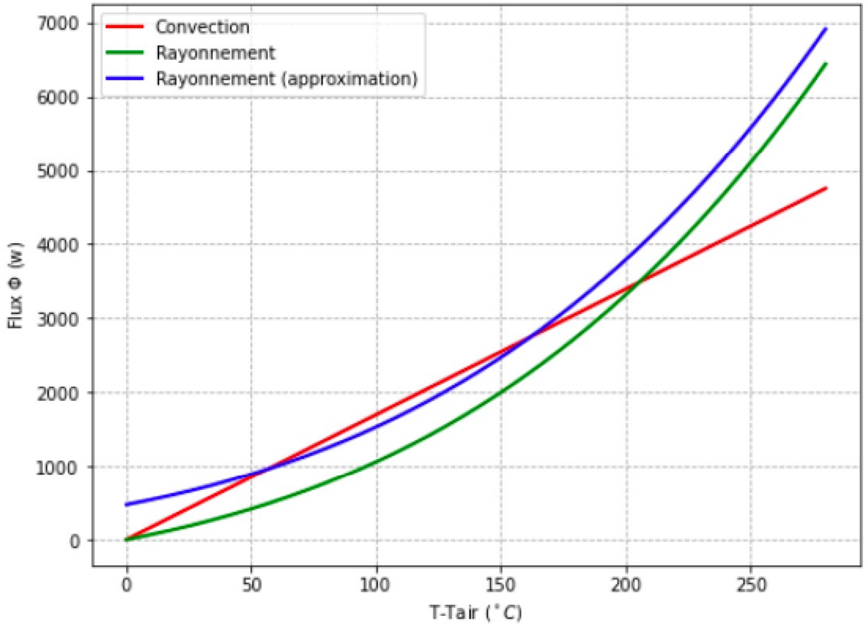
Rayonnement

$$\Phi_{rayonnement} = \sigma * \left(T^4 - {T_\infty}^4\right) * S$$

$$\Phi_{rayonnement\_approx} = \sigma * T^4 * S$$

$S = 4\,\pi\, r^2$

????



$T = [20\ °\mathrm{C}, 300\ °\mathrm{C}]$

$T_\infty = 20\ °\mathrm{C}$

$r = 0.3\ m$

h : le coefficient de transfert thermique, $h = 15\ \dfrac{W}{m^2 K}$

σ : la constante de Stefan-Boltzmann, $\sigma = 5.67 \times 10e{-8}\ \dfrac{W}{m^2 K^4}$.

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

```python
r=0.3
h=15

s=4*np.pi*r**2
```

```python
r=0,3
h=15

s=4* pi*r**2
```

```python
sigma=5.67*1e-8 # W/(m*m*K)
```

```python
σ=5.67*10**-8 # W/(m*m*K)
```

$$T = [20\ °\mathrm{C}, 300\ °\mathrm{C}]$$

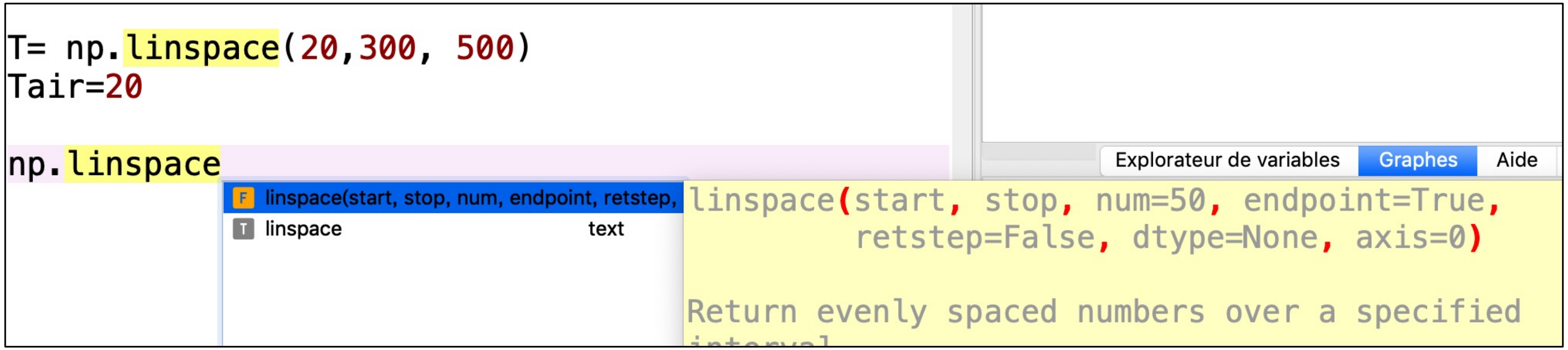
$$\Phi_{conv} = h * (T - T_\infty) * S$$

$$\Phi_{rayonnement} = \sigma * \left(T^4 - {T_\infty}^4\right) * S$$

$$\Phi_{rayonnement\_approx} = \sigma * T^4 * S$$

```
T= np.linspace(20,300, 500)
Tair=20

PHI_conv=h*(T-Tair)*s
PHI_ray= sigma * (  (T+273)**4-(Tair+273)**4  )*s
PHI_ray_approx= sigma * (T+273)**4 *s
```



```python
plt.figure(figsize=(8, 6))

plt.plot(T-Tair, PHI_conv, 'r-',label='Convection',lw=2)
plt.plot(T-Tair, PHI_ray, 'g-',label='Rayonnement',lw=2)
plt.plot(T-Tair, PHI_ray_approx, 'b-',label='Rayonnement (approximation)',lw=2)

plt.grid(ls='--')
plt.legend(loc=0)
plt.xlabel('T-Tair ($^\circ C$)')
plt.ylabel(r'Flux $\Phi $ (w)')
#plt.axis([50,70,0,4000])
```