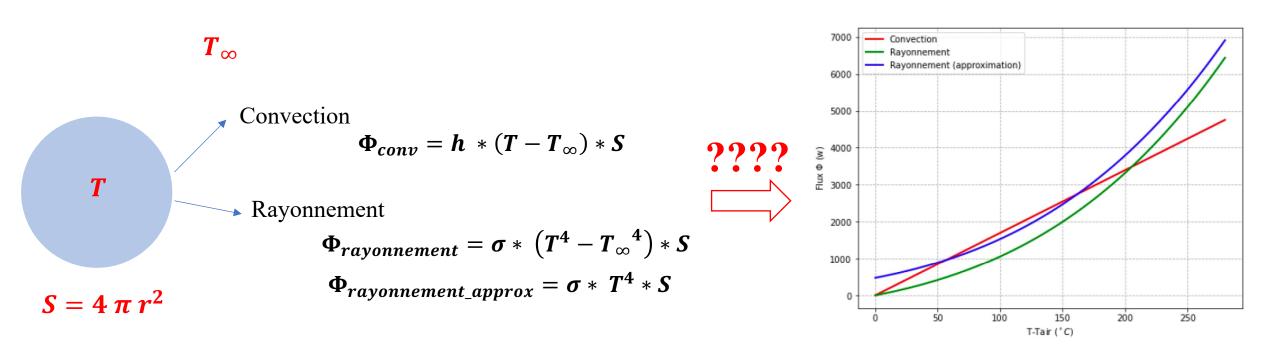
## Simulation d'examen python

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



$$T = [20 \, ^{\circ}\text{C}, 300 \, ^{\circ}\text{C}]$$

$$T_{\infty}=20~^{\circ}\mathrm{C}$$

$$r = 0.3 m$$

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

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

import numpy as np
import matplotlib.pyplot as plt





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

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



s=4\* pi\*r\*\*2

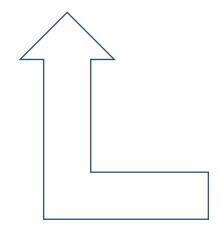
$$\sigma = 5.67 \times 10 \times -8 \# W/(m \times m \times K)$$



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

```
T = [20 \, ^{\circ}\text{C}, 300 \, ^{\circ}\text{C}]
\Phi_{conv} = h * (T - T_{\infty}) * S
\Phi_{rayonnement} = \sigma * (T^4 - T_{\infty}^4) * S
\Phi_{rayonnement\_approx} = \sigma * T^4 * S
```

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



```
T= np.<mark>linspace</mark>(20,300, 500)
Tair=20
np. linspace
                                                                          Explorateur de variables
                                                                                           Graphes
                  inspace(start, stop, num, endpoint, retstep, linspace(start, stop, num=50, endpoint=True,
               Inspace
                                                         retstep=False, dtype=None, axis=0)
                                             Return evenly spaced numbers over a specified
```

```
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)
                                                    Convection
plt.xlabel('T-Tair ($^\circ C$)')
                                                    Rayonnement
                                                    Rayonnement (approximation)
plt.ylabel(r'Flux $\Phi $ (w)')
                                           6000
#plt.axis([50,70,0,4000])
                                           5000
                                           4000
                                         Iux (w)
                                           3000
                                           2000
                                           1000
                                              0
                                                          50
                                                                  100
                                                                          150
                                                                                   200
                                                                                            250
                                                                      T-Tair ( * C)
```