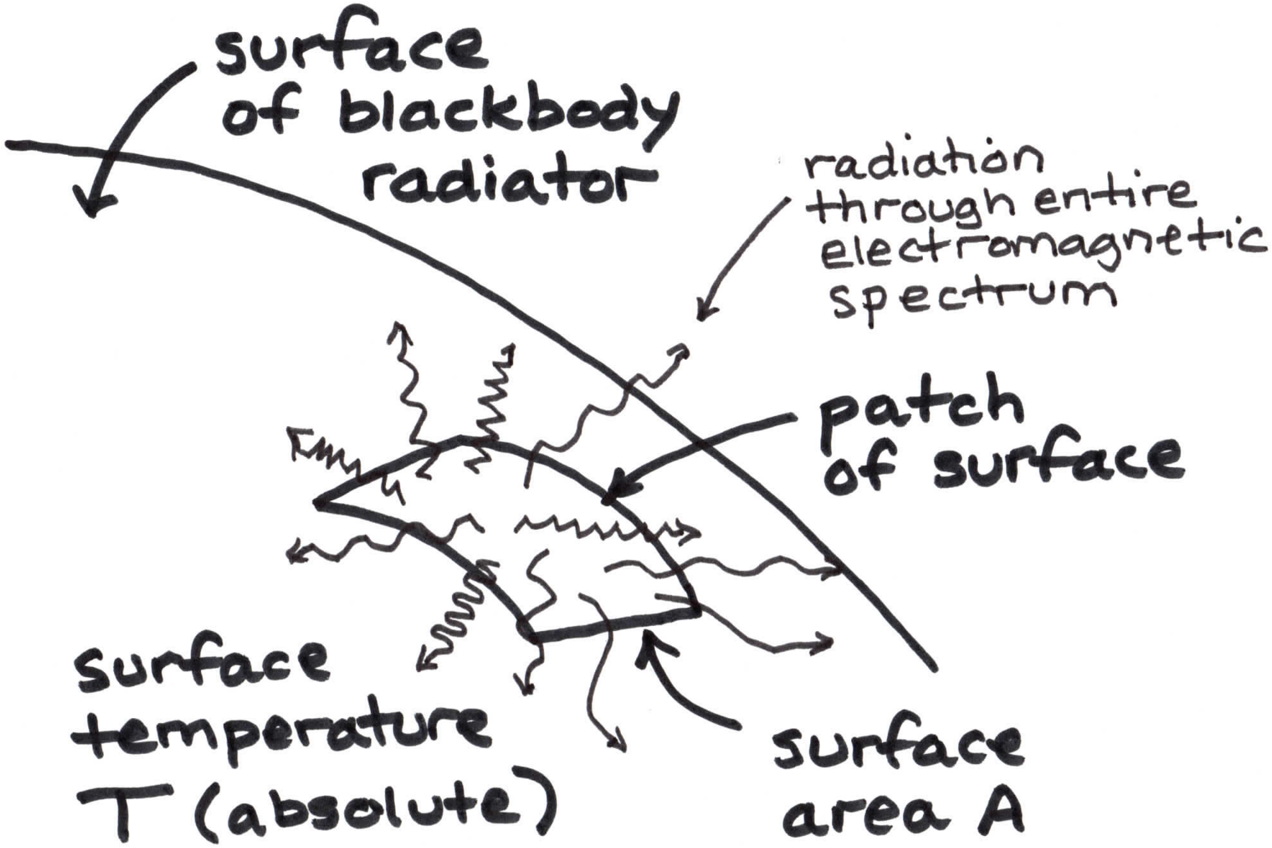
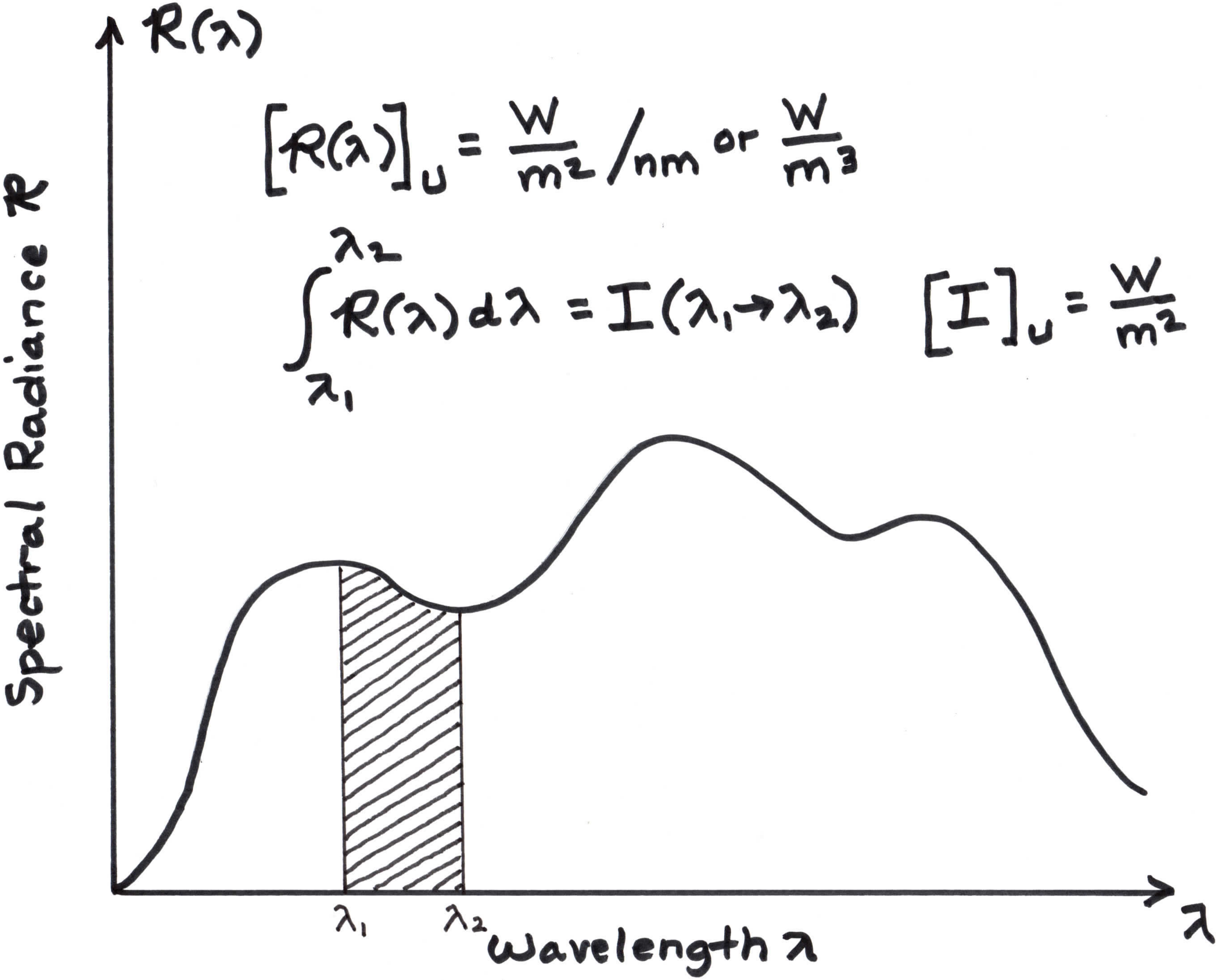
Blackbody Radiation

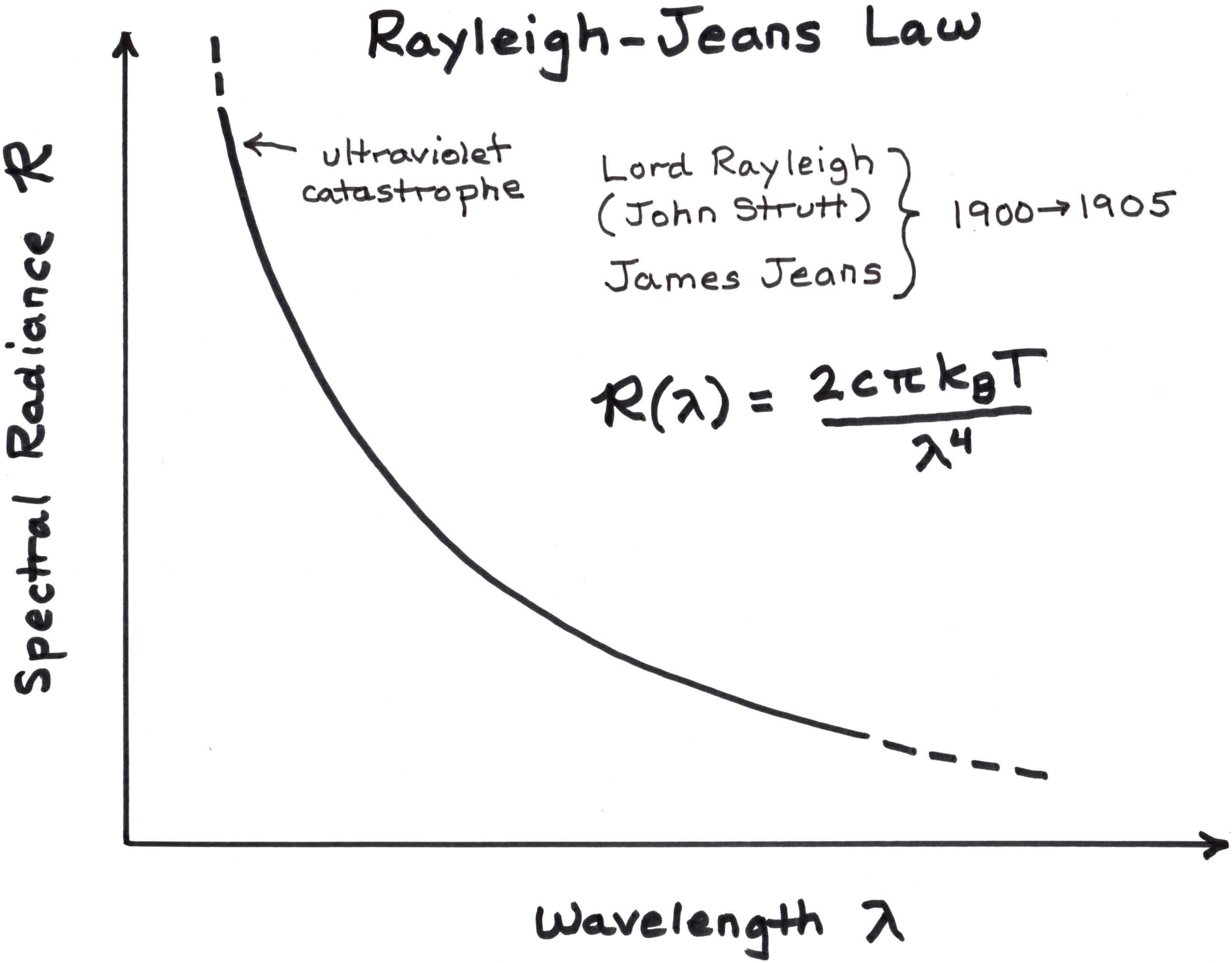


I = intensity of electromagnetic radiation (W/m^2)

P = power of electromagnetic radiation (W)

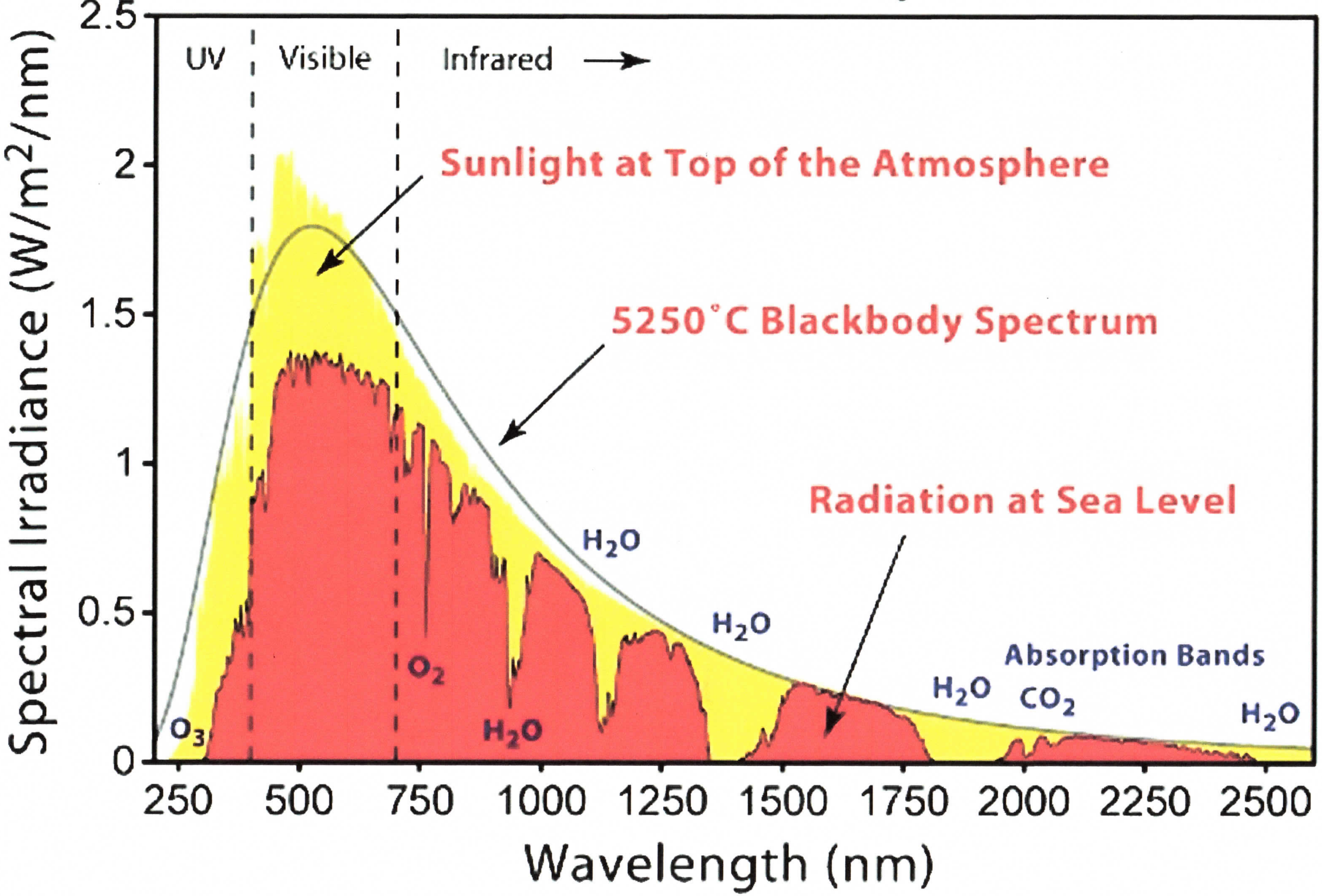
$$P = I A$$


R(λ)
[R(λ)]_u = W/m² /nm or W/m³
∫_{λ1}^{λ2} R(λ) dλ = I(λ1→λ2)   [I]_u = W/m²
Spectral Radiance R
λ1
λ2
Wavelength λ
λ

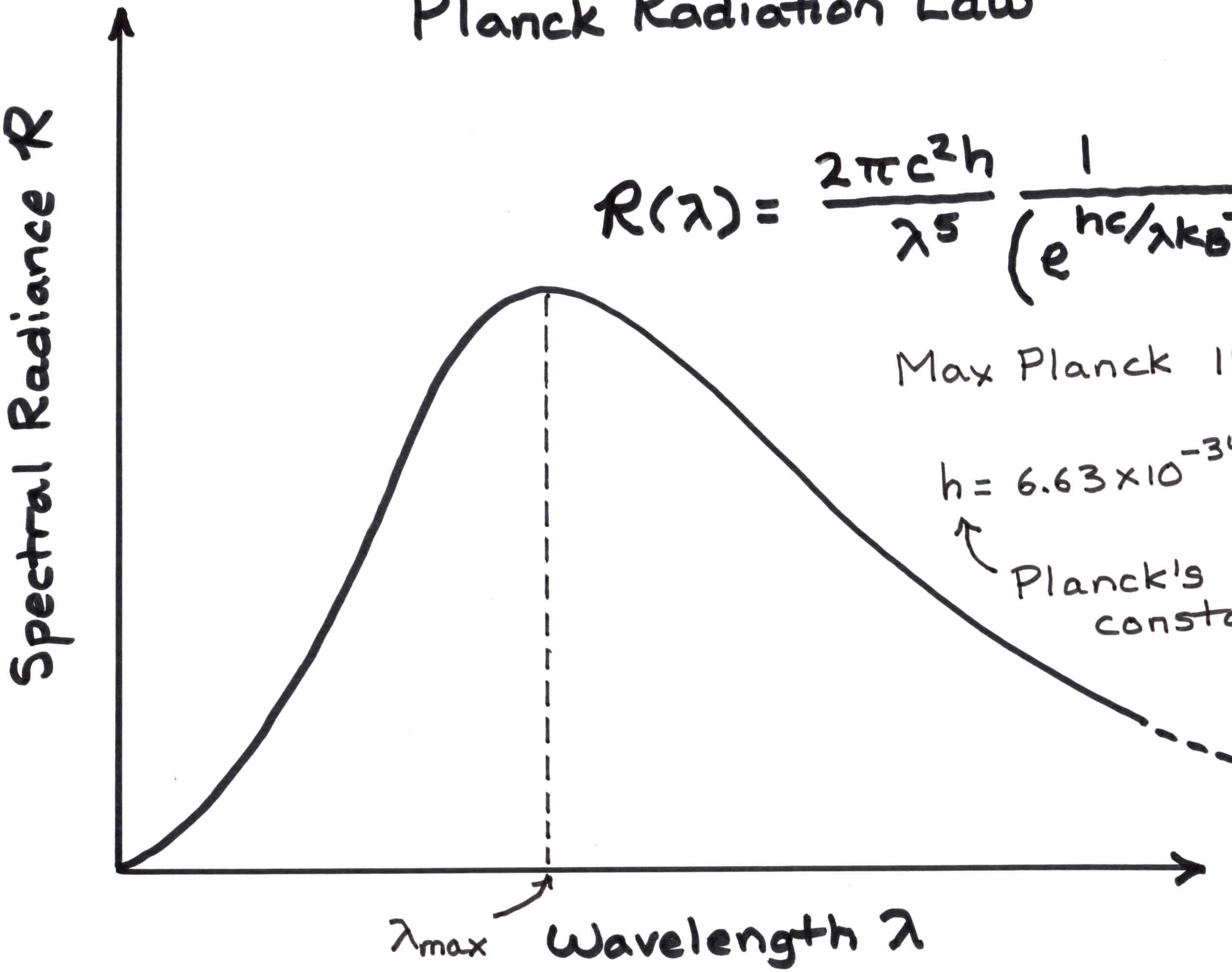


Rayleigh-Jeans Law
ultraviolet catastrophe
Lord Rayleigh (John Strutt)
James Jeans
1900→1905
$R(\lambda) = \frac{2c\pi k_B T}{\lambda^4}$
Spectral Radiance R
Wavelength λ

Solar Radiation Spectrum



Planck Radiation Law

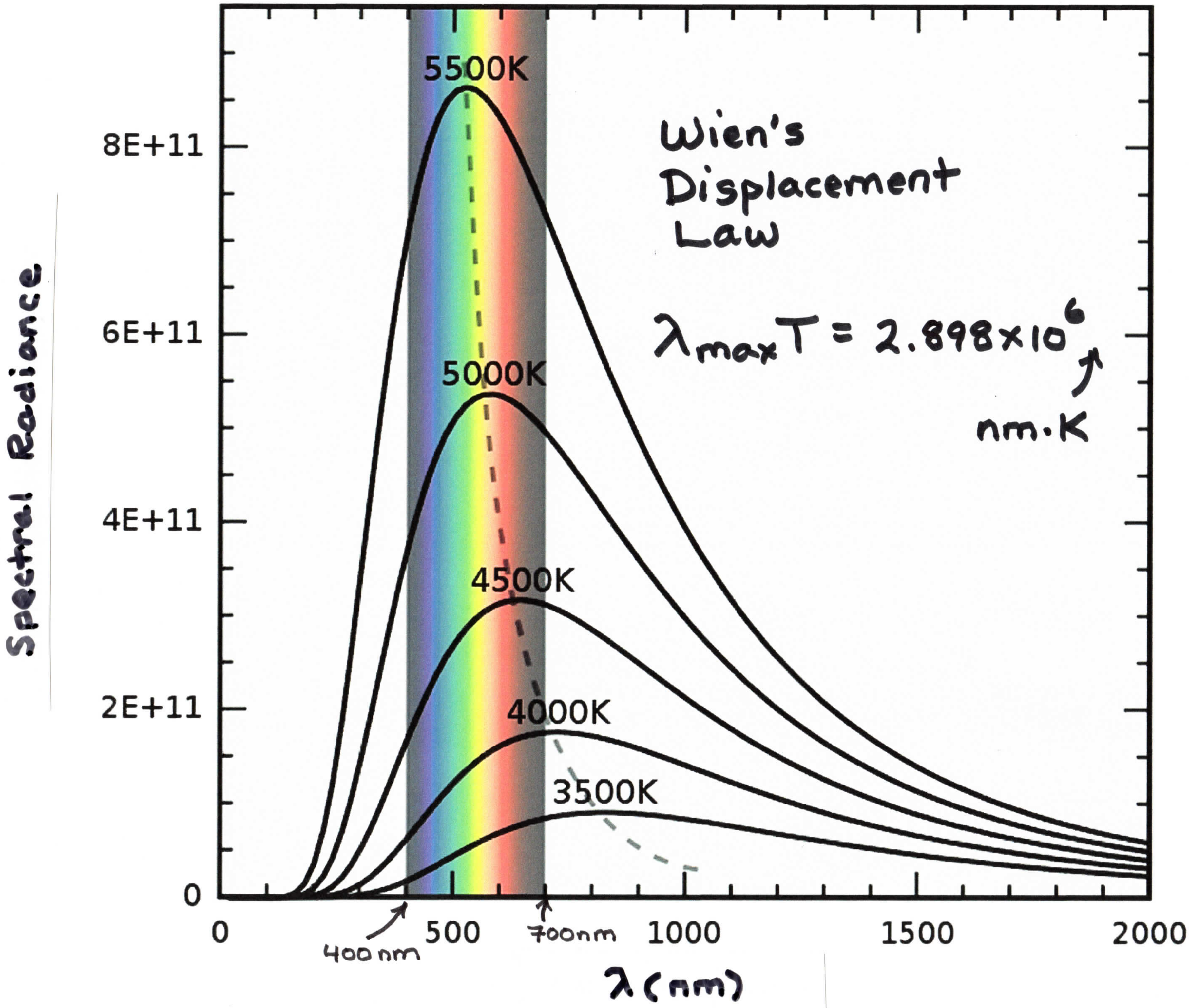


$$R(\lambda) = \frac{2\pi c^2 h}{\lambda^5} \frac{1}{\left(e^{hc/\lambda k_B T} - 1\right)}$$

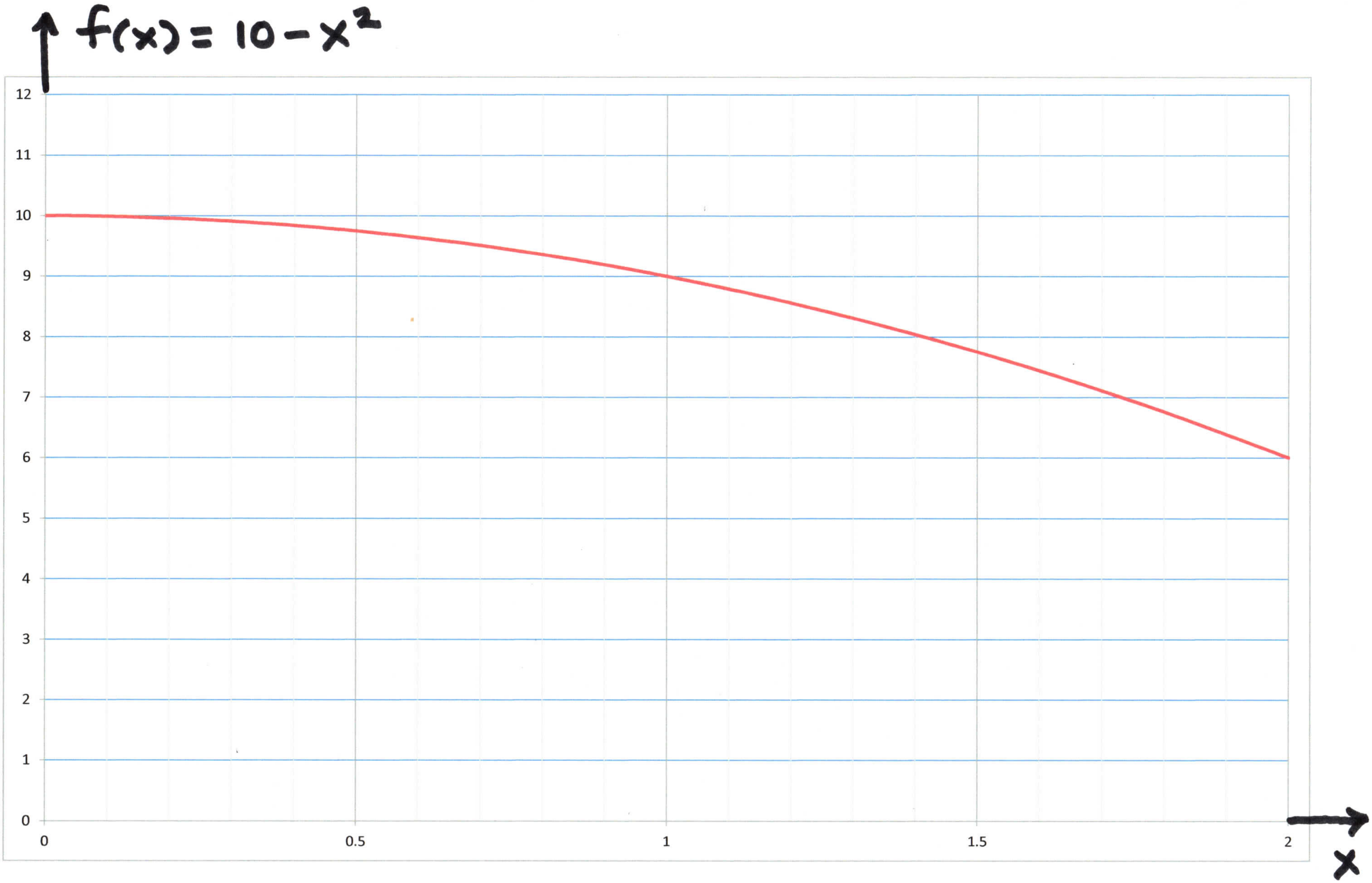
Max Planck 1900

$h = 6.63 \times 10^{-34}$ J·s

↑ Planck's constant



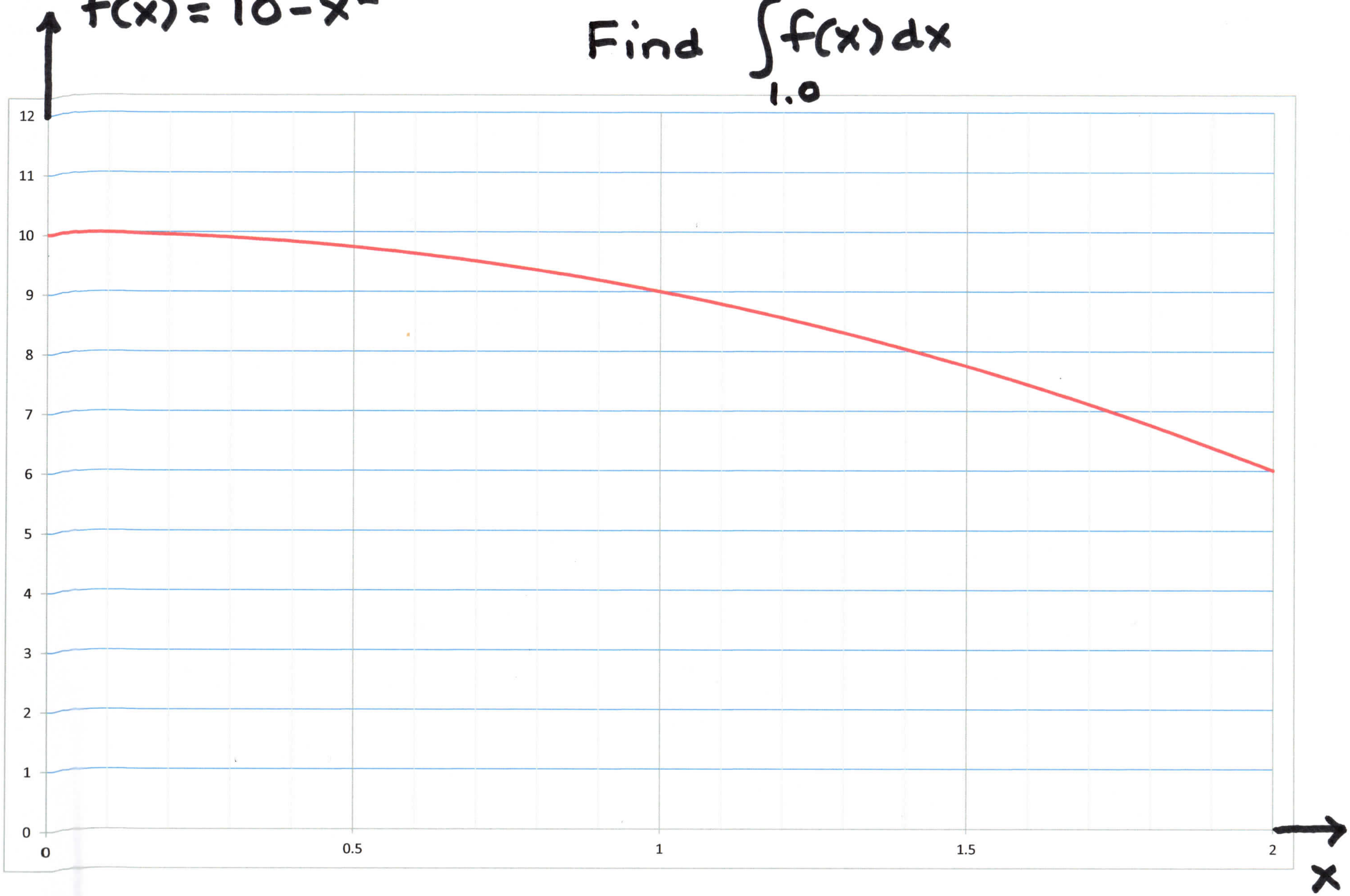
Wien's Displacement Law
$\lambda_{max} T = 2.898 \times 10^6$
nm·K
5500K
5000K
4500K
4000K
3500K
8E+11
6E+11
4E+11
2E+11
0
Spectral Radiance
0
500
1000
1500
2000
400nm
700nm
λ (nm)



f(x) = 10 - x²
12
11
10
9
8
7
6
5
4
3
2
1
0
0
0.5
1
1.5
2
x

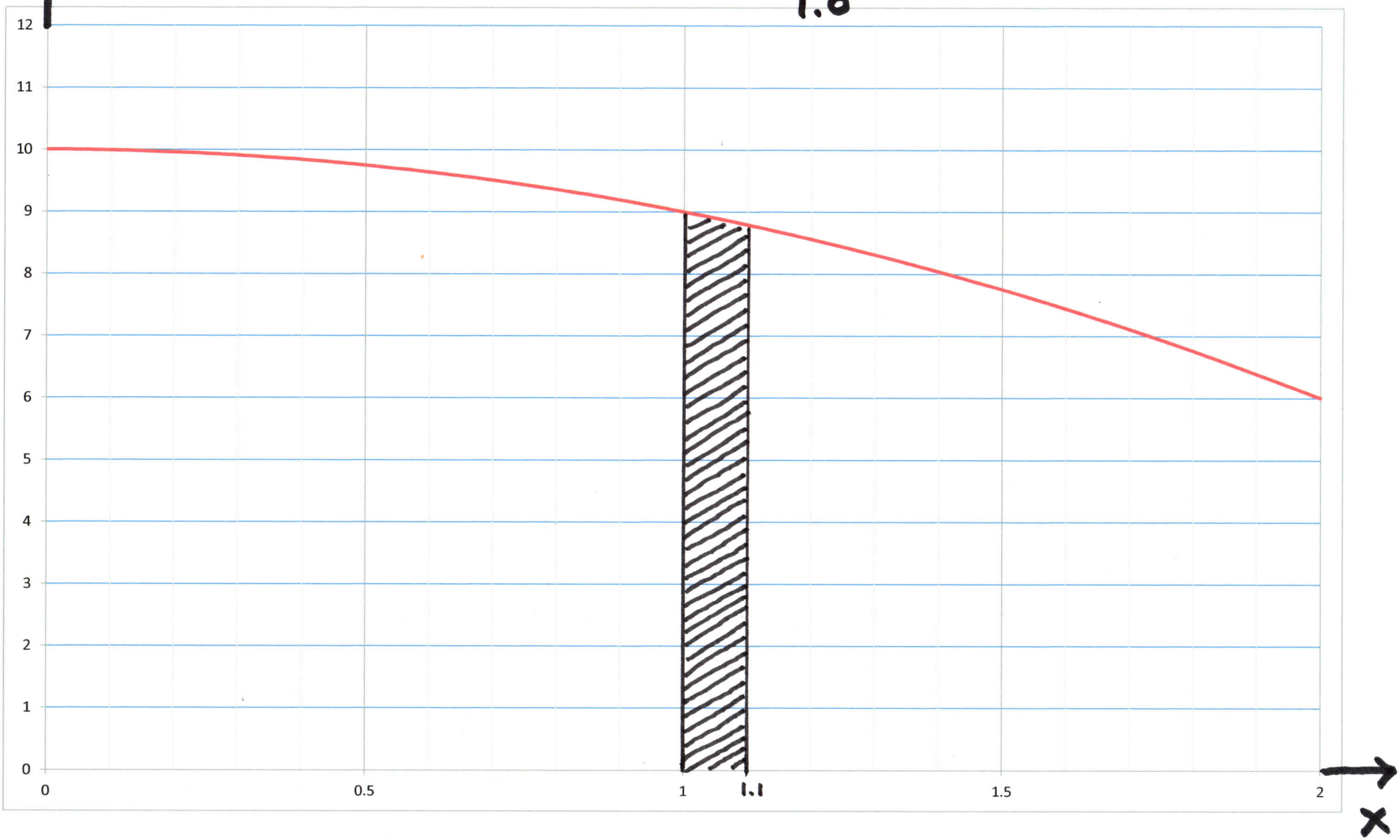
$f(x) = 10 - x^2$

Find $\int_{1.0}^{1.1} f(x)\,dx$



$f(x) = 10 - x^2$

Find $\int_{1.0}^{1.1} f(x)\,dx$

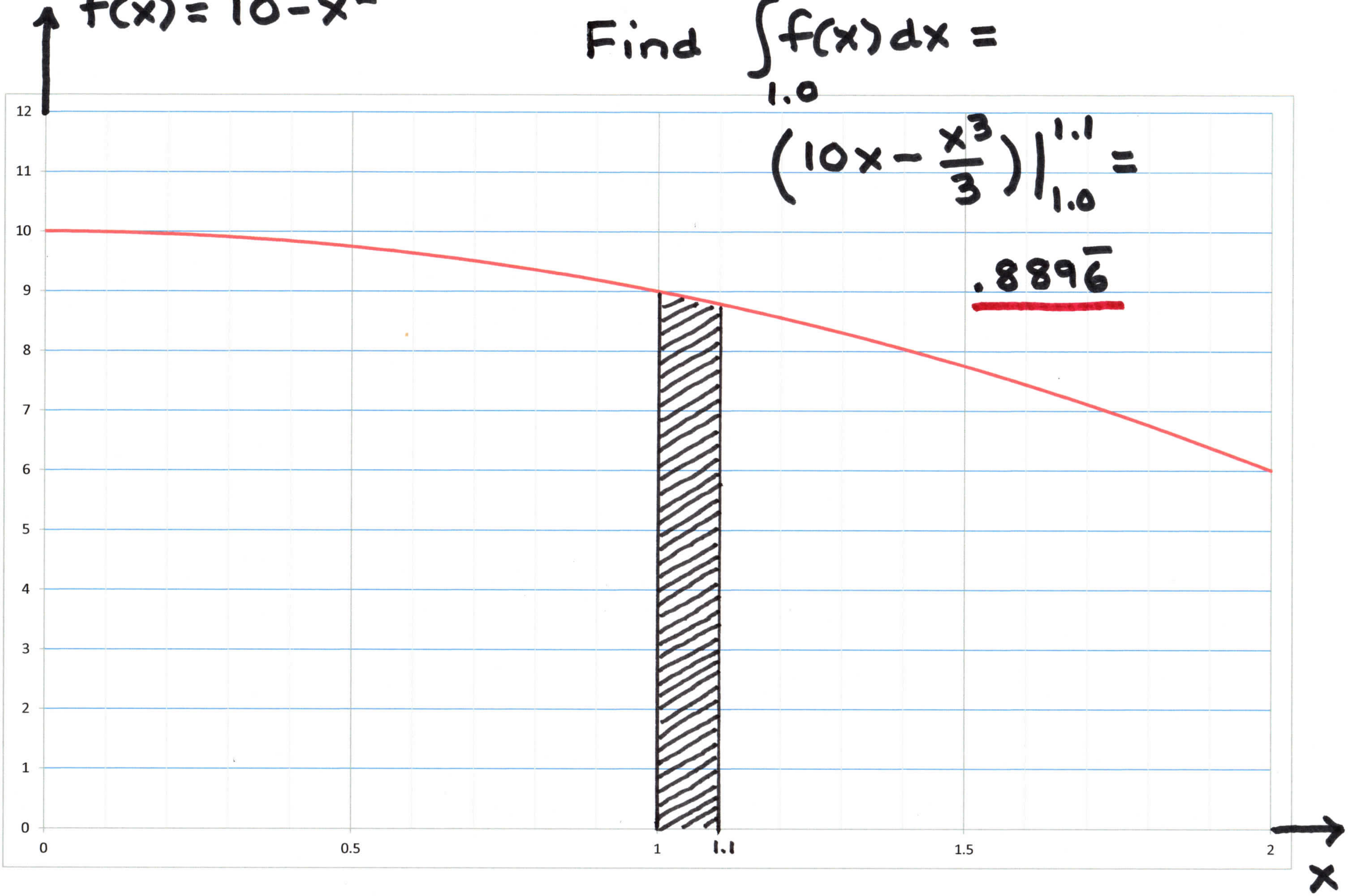


$f(x) = 10 - x^2$

Find $\int_{1.0}^{1.1} f(x)\,dx =$

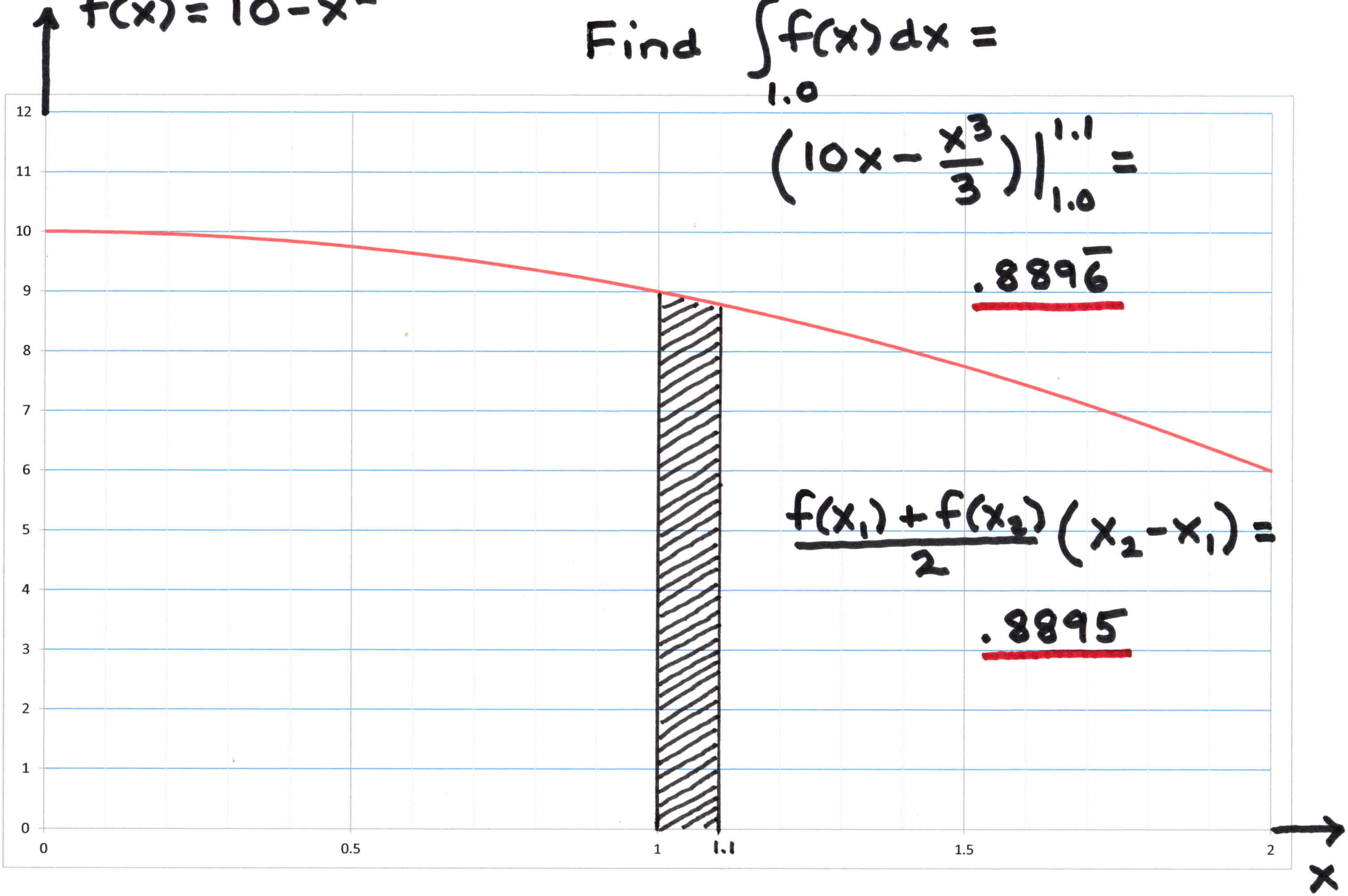
$\left(10x - \frac{x^3}{3}\right)\Big|_{1.0}^{1.1} =$

$.889\overline{6}$



$$f(x) = 10 - x^2$$

Find $\int_{1.0}^{1.1} f(x)\,dx =$



$$\left(10x - \frac{x^3}{3}\right)\Big|_{1.0}^{1.1} =$$

$.889\overline{6}$

$$\frac{f(x_1) + f(x_2)}{2}(x_2 - x_1) =$$

$.8895$

$f(x) = 10 - x^2$

Find $\int_{1.0}^{1.1} f(x)\,dx =$