Задание 7.5

$S = 50 \frac{W}{m^2}$

$r = 7{,}18 \cdot 10^{11} m$

$R_\odot = 6{,}96 \cdot 10^8 m$

a) $S = 4\pi r^2$

$S = \frac{P}{S}$

$P = S \cdot S$

$\underline{P = S \cdot 4\pi r^2 = 4\pi r^2 S}$

$P = 4 \cdot 3{,}14 \cdot 50 \frac{W}{m^2} \cdot (7{,}18 \cdot 10^{11} m)^2 =$

$38\,207{,}52 \cdot 10^{22} W \approx \underline{3{,}82 \cdot 10^{26} W}$

b) $I = \sigma T^4$

$\sigma = 5{,}67 \cdot 10^{-8} \frac{W}{m^2 K^4}$

$I = \frac{P}{S_\odot}$, $S_\odot = 4\pi R_\odot^2$

$I = \frac{P}{4\pi R_\odot^2}$

$\Downarrow$

$I = \frac{4\pi r^2 S}{4\pi R_\odot^2}$

$\frac{r^2 S}{R_\odot^2} = \sigma T^4$

$T^4 = \frac{r^2 S}{\sigma R_\odot^2}$

$T = \sqrt[4]{\frac{S}{\sigma} \cdot \frac{r^2}{R_\odot^2}}$

$T = \sqrt[4]{\frac{S}{\sigma}} \cdot \sqrt[4]{\frac{r^2}{R_\odot^2}}$

$\rightarrow T = \sqrt{\frac{50 \frac{W}{m^2}}{5{,}67 \cdot 10^{-8} \frac{W}{m^2 K^4}}} \cdot \sqrt{\frac{7{,}18 \cdot 10^{11} m}{6{,}96 \cdot 10^8 m}} \approx$

$\sqrt{8{,}818 \cdot 10^8 K^4} \cdot \sqrt{1{,}121 \cdot 10^3} \approx$

$1{,}723 \cdot 10^2 K \cdot \sqrt{1121} \approx$

$172{,}3 K \cdot 33{,}48 \approx \underline{5769 K}$

c) $\lambda_{max} = \frac{b}{T}$ $b = 2{,}9 \cdot 10^{-3} K \cdot m$

$\lambda_{max} = \frac{2{,}9 \cdot 10^{-3} K \cdot m}{5769 K} =$

$5{,}03 \cdot 10^{-4} \cdot 10^{-3} m =$

$503 \cdot 10^{-9} m = \underline{503 nm}$