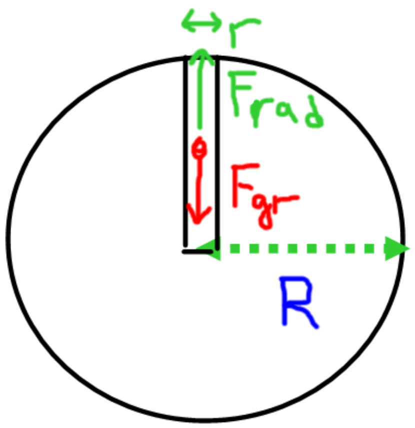
1.d)



$F_{gr} = G\frac{mM}{(R/2)^2}$-Gravitational force

$F_{rad}\Delta t = \Delta p$ – Newton's Law for radiational force

$\Delta p = mc = E/c$- Photons impulse

$F_{rad}\Delta t = E/c$

$L = E/\Delta t$ – luminosity of the star

$F_{rad} = \frac{E}{c\Delta t} = \frac{L}{c}$- Radiational force

$F_{gr} = F_{rad}$ – equilibrium of the forces

$G\frac{mM}{(R/2)^2} = \frac{L}{c}$ equilibrium of the forces

$L = 4\pi r^2\sigma T^4$- luminosity of the star

$$G\frac{mM}{(R/2)^2} = \frac{4\pi r^2\sigma T^4}{c}$$

$$G\frac{\pi r^2 R\rho M}{(R/2)^2} = \frac{4\pi r^2\sigma T^4}{c}$$

$$G\frac{\rho M}{R} = \frac{\sigma T^4}{c}$$

$$G\frac{4\rho\pi R^3\rho}{3R} = \frac{\sigma T^4}{c}$$

$$G\frac{4\rho^2\pi R^2}{3} = \frac{\sigma T^4}{c}$$

$\rho = \sqrt{\frac{3\sigma T^4}{4\pi R^2 Gc}}$ – density of the star

$$\rho = \sqrt{\frac{3 * 5.67 * 10^{-8} * 10^{32}}{4\pi 10^{16} * 6.67 * 10^{-11} * 3 * 10^{8}}} = 82247 \frac{kg}{m^3}$$

$M = \frac{4\pi R^3}{3}\rho$ –mass of the star

$$M = \frac{4\pi 10^{24}}{3} * 82247 = 2 * 10^{31}$$

ANSWER: $M = 10M_{sun}$- mass of the star