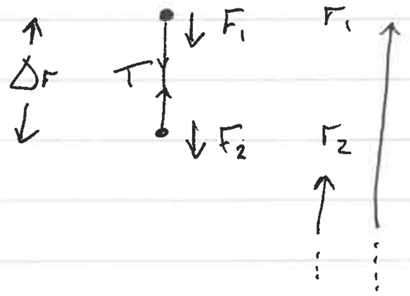
6)



$$F_1 = \frac{GMm}{r_1^2} \qquad F_2 = \frac{GMm}{r_2^2}$$

$$r_1 = r_2 + \Delta r$$

$$F_1 + T = F_2 - T$$

$$2T = F_2 - F_1 = GMm\left(\frac{1}{r_2^2} - \frac{1}{r_1^2}\right)$$

$$T = \frac{GMm}{2}\left(\frac{r_1^2 - r_2^2}{r_1^2 r_2^2}\right)$$

$$= \frac{GMm}{2}\left(\frac{\cancel{r_2^2} + 2r_2\Delta r + \Delta r^2 - \cancel{r_2^2}}{r_1^2 r_2^2}\right)$$

$$= \frac{GMm\,\Delta r}{2}\frac{(2r_2 + \Delta r)}{r_1^2 r_2^2} = \frac{GMm\,\Delta r}{2}\frac{(r_1 + r_2)}{r_1^2 r_2^2}$$

At the horizon, assuming Schwarschild:

$$r_s = \frac{2GM}{c^2}$$

Thus $T = \frac{GMm\,l}{\cancel{2}} \frac{(\cancel{2}r_s)}{r_s^{\cancel{4}\,3}}$ assuming $l \ll r_s$

$$= \frac{GMm\,l}{\left(\frac{2GM}{c^2}\right)^3} = \frac{mc^6 l}{8G^2M^2}$$

For stellar mass, this gives $F \sim 5 \times 10^{11}$ N

supermassive $F \sim 5 \times 10^{-5}$ N

Note that this scales as M^{-2}, so could be several orders of mag. different.