2a)

$$\sum_{m_1} F = F_c$$

$$F_T = \frac{m_1 v^2}{r} \qquad (1)$$

But m_2 is stationary, and F_T is uniform in a string.

$$\sum_{m_2} F = 0$$

$$F_T - F_g = 0$$

$$F_T = F_g$$

$$= m_2 g \qquad (2)$$

Substitute (2) into (1).

$$m_2 g = \frac{m_1 v^2}{r}$$

$$g = \frac{v^2}{r} \cdot \frac{m_1}{m_2}$$

$$v^2 = g r \frac{m_2}{m_1}$$

By the kinematic equations,

$$T = \frac{2\pi r}{v}$$

$$= \frac{2\pi r}{\sqrt{g r \frac{m_2}{m_1}}}$$

$$= 2\pi \cdot \frac{r}{\sqrt{r}} \cdot \sqrt{\frac{m_1}{m_2 g}}$$

$$T = 2\pi \sqrt{\frac{m_1 r}{m_2 g}}$$ as required.

b) From (a), $$T = 2\pi\sqrt{\frac{m_1 r}{m_2 g}}$$

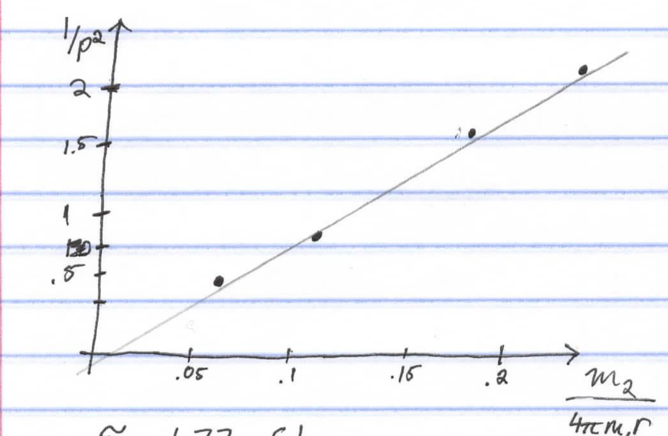
$$T^2 = \frac{4\pi^2 m_1 \cdot r}{m_2 \cdot g}$$

$$\frac{1}{T^2} = g\left[\frac{m_2}{4\pi^2 m_1 \cdot r}\right]$$

The graph of $1/p^2$ against $\frac{m^2}{4\pi^2 m_1 r}$ should yield a straight line with slope g.

c)

m_2	0.020	.040	.060	.080
P	1.40	1.05	0.80	.75
$1/p^2$	.51	.91	1.56	1.77
$\frac{m_2}{4\pi^2 m_1 \cdot r}$	.0528	.1055	.1583	.211



d) $$g \approx \frac{1.77 - .51}{.211 - .0528} = 7.96\ \frac{m}{s^2}$$