16.1

distance waves traveled $d = (7.80 \frac{km}{s}) t = (4.50 \frac{km}{s})(t + 17.3 s)$

↑ p-wave time

$(7.80 - 4.50)t + (4.5)(17$

$$t = \frac{(4.50 \ km/s)(17.3 s)}{(7.80 - 4.50)\frac{km}{s}} = \underline{23.6 s}$$

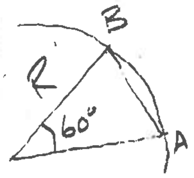
then

$$d = (7.80 \frac{km}{s})(23.6 s) = \underline{\underline{184 \ km}}$$

16.2

(a) P-wave travels faster and shorter dist. so it arrives first

(b)



P-wave dist $= 2R \sin 30° = 2(6.37 \times 10^6 m) \sin 30° = 6.37 \times 10$

$$\Delta t_p = \frac{6.37 \times 10^6 m}{7800 m/s} = 817 s$$

Rayleigh wave dist $s = R\theta = (6.37 \times 10^6 m)(60° \times \frac{\pi \ rad}{180°}) = 6.67 \times 10^6 m$

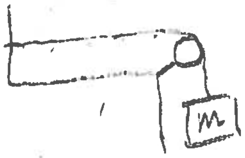
$$\Delta t_R = \frac{6.67 \times 10^6 m}{4500 m/s} = 1482 s$$

$$\Delta t = 1482 s - 817 s = \underline{665 s} = \underline{11.1 \ min}$$

16.13

wave speed = 24 m/s

m = 3 kg



a) Tension in string

$F = mg = (3 kg)(9.80 \frac{m}{s^2}) = 29.4 N$

$$v = \sqrt{\frac{F}{\mu}} \Rightarrow \mu = \frac{F}{v^2} = \frac{29.4 N}{(24 m/s)^2} = \underline{\underline{0.0510 \frac{kg}{m}}}$$

b) $F = mg = (2 kg)(9.80 m/s^2) = \underline{19.6 N}$

$$v = \sqrt{\frac{F}{\mu}} = \sqrt{\frac{19.6 N}{0.0510 \ kg/m}} = \underline{\underline{19.6 \frac{m}{s}}}$$