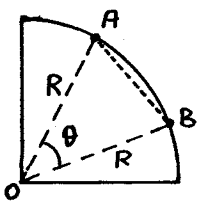
PHY 262 — **Homework 3 (Ch 16)** — Spring 2003

1. (SB 5)

(a) The longitudinal wave travels a shorter distance at a higher speed, therefore it will arrive at B first.

(b) distance travelled by the transverse wave, d_t

$= R\theta$



distance travelled by the longitudinal wave, d_l

$= R$ ($\because$ OAB is an equilateral triangle)

R = radius of the Earth

$\theta = 60° = \frac{\pi}{3}$ rad

$\therefore$ the time difference $= \frac{R\theta}{4.50 \text{ km s}^{-1}} - \frac{R}{7.80 \text{ km s}^{-1}}$

$= 665$ s #

2. (SB8) $y_1 = 3.0\cos(4.0x - 1.6t)$

$y_2 = 4.0\sin(5.0x - 2.0t)$

let $y(x,t) = y_1 + y_2$

(a) $y(x=1.00, t=1.00) = -1.65$ #

(b) $y(x=1.00, t=0.500) = -6.02$ #

(c) $y(x=0.500, t=0) = 1.15$ #

3. (SB13)

linear density of the string, $\mu = \frac{0.004 \text{ kg}}{1.60 \text{ m}} = 0.0025 \text{ kg m}^{-1}$

tension in the string, $F = mg_{Moon}$ ($m = 3.00$ kg)

wave speed, $v = \frac{1.60 \text{ m}}{36.1 \times 10^{-3} \text{ s}}$

$\because v = \sqrt{\frac{F}{\mu}} = \sqrt{\frac{mg_{Moon}}{\mu}}$

$\therefore g_{Moon} = \frac{\mu v^2}{m} = 1.64 \text{ ms}^{-2}$ #

4. (SB29) $y = (0.25 \text{ m})\sin(0.30x - 40t)$

(a) amplitude, $A = 0.25$ m #

(b) angular frequency, $\omega = 40 \text{ rad s}^{-1}$ #

(c) wave number, $k = 0.300 \text{ m}^{-1}$ #

(d) wavelength, $\lambda = 2\pi/k = 20.9$ m #

(e) wave speed, $v = \omega/k = 133 \text{ ms}^{-1}$ #

(f) direction of motion : $+x$ direction #

5. (SB27) frequency, $f = 4.00$ Hz

wavelength, $\lambda = 60.0$ cm $= 0.60$ m

$\therefore$ wave speed, $v = f\lambda$

$= 2.40 \text{ ms}^{-1}$ #