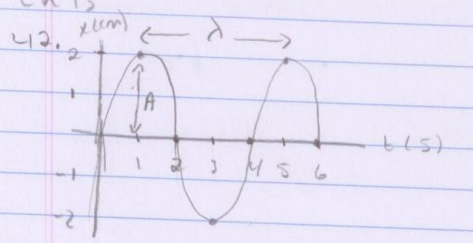
Ch 13

42. 

a) Amplitude A = 2.0 cm = 0.02 m

b) Period (T) = 4.0 s

c) Frequency (f) = 1/4.0 s = 0.25 Hz

d) max v of object

$v = 2\pi f A \cos(2\pi f t)$ so max v =

$= 2\pi f A = 2\pi\ 0.25\text{Hz}\ 0.02\text{m} = 0.031\ m/s$

e. $a = -4\pi^2 f^2 A \sin(2\pi f t)$ so max $a = 4\pi^2 f^2 A$

$= 4\pi^2 (0.25\text{Hz})^2\ 0.02\text{m} = 0.049\ m/s^2$

f. $x = A \sin(2\pi f t)$

$= 0.02\text{m} \sin(2\pi\ 0.25\ t)$

$= 0.02\text{m} \sin(0.5\pi t)$

Additional Problems

1. $x = 0.015\text{m} \sin(12\pi t)$

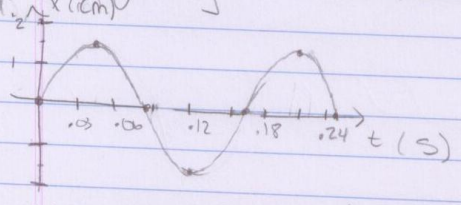
a. Amplitude A = 0.015 m

b. Period T? general form $x = A \sin(2\pi f t)$

So 12π must equal $2\pi f$

$12\pi = 2\pi f$ $f = 6$ Hz & $T = 1/f = 1/6\text{Hz} = 0.167$ s

c. Frequency $f = 1/T = 1/0.167\text{s} = 6$ Hz

d. 

e. $v = 2\pi f A \cos(2\pi f t)$

$v = 2\pi\ 6\text{Hz}\ 0.015\text{m} \cos(2\pi\ 6\text{Hz}\ t)$

$\boxed{v = 0.57\ m/s \cos(12\pi t)}$

$a = -(2\pi f)^2 A \sin(2\pi f t)$

$\boxed{a = -21\ m/s^2 \sin(12\pi t)}$

f. max speed is when $\cos(12\pi t) = 1$

max $v = 0.57\ m/s$

64. a) Amplitude = 15 cm

b) $\lambda = 12.0\text{m}$ $f = 1.25\text{Hz}$

$v = \lambda f = 12\text{m} \cdot 1.25\text{Hz}$

$= \underline{15\text{ m/s}}$