

Ex 17.2

$$y_m = 1.8 \text{ cm}, \quad \lambda = 2.75 \text{ cm}, \quad T = 2.5 \text{ s}$$

$$v = \lambda / T = 1.1 \text{ cm/s}$$

$$y = 1.8 \sin 2\pi \left(\frac{x}{2.75} - t/2.5 \right)$$

Ex 17.4 (a) The waves must have the same speed because they travel in the same medium.

(b) #1: $y_m = 3 \text{ m}, \lambda = 8 \text{ m}, T = 4 \text{ s}, f = 1/T = 0.25 \text{ Hz}$
 $v = \lambda f = 2.0 \text{ m/s}$

#2: $y_m = 3 \text{ m}, \lambda = 2 \text{ m}, T = 2 \text{ s}, f = 1/T = 0.50 \text{ Hz}$
 $v = \lambda f = 1.0 \text{ m/s}$

(c) Same, but change v to $-v$.

Ex 17.6 $y_m = 3 \text{ m}, \lambda = 2 \text{ m}, T = 2 \text{ s}, f = 1/T = 0.5 \text{ Hz}$

$$y(x,t) = 3.0 \sin 2\pi \left(\frac{x}{2} + \frac{t}{2} \right)$$

Note that sine gives node at $x=0$, cosine gives antinode.

Prob 17.1

$$T = 2 \text{ s} \quad f = 1/T = 0.50 \text{ Hz}$$

Prob 17.2

$$\text{peak wave } 8.0 \text{ m} \sim 1 \text{ s} \Rightarrow 8.0 \text{ m/s}$$

Prob 17.3

$$f(x,t) \quad v = 2.0 \text{ m/s}$$

$$g(x,t) \quad v = 4.0 \text{ m/s}$$

$$v = \sqrt{\frac{F}{\mu}} \Rightarrow \mu = \frac{F}{v^2} \quad \text{or} \quad \frac{F_1}{v_1^2} = \frac{F_2}{v_2^2}$$

$$F_2 = F_1 \frac{v_2^2}{v_1^2} = (500 \text{ N}) \left(\frac{4 \text{ m/s}}{2 \text{ m/s}} \right)^2 = 2000 \text{ N}$$

Prob 17.7

$$\lambda = 4.0 \text{ cm} \quad T = 2.0 \text{ s}$$

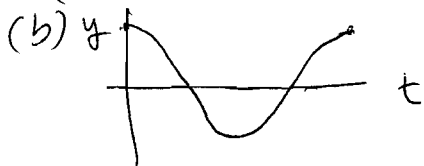
$$v = \lambda / T = 2.0 \text{ cm/s}$$

Prob. 17.10 (a) $3 \text{ waves} = 8.0 \text{ m} \Rightarrow \lambda = 2.67 \text{ m}$
 $T = 2.0 \text{ s} \quad f = 1/T = 0.50 \text{ Hz}$

(b) Max. $v = \lambda f = 3 \text{ s} \Rightarrow v = 1.33 \text{ m/s}$
 $f\lambda = (0.50 \text{ Hz})(2.67 \text{ m}) = 1.33 \text{ m/s}$

(c) $y(x, t) = 4.0 \cos 2\pi \left(\frac{x}{2.67} + \frac{t}{2.0} \right)$

Prob. 17.11 (a) $\lambda = 8 \text{ m} \quad T = 2.0 \text{ s} \quad v = \lambda f = 4.0 \text{ m/s}$



(c) $y=0$ at $x=0 \quad y = 5 \cos 2\pi t/2.0$ at $x=2 \text{ m}$

(d) $y(x, t) = 5 \sin 2\pi x/8.0 \cos 2\pi t/2.0$

Prob 17.12 (a) f: $\lambda = 4.0 \text{ m}, T = 6.0 \text{ s}, f = \frac{1}{6} \text{ Hz}, v = 0.67 \text{ m/s}$
 g: $\lambda = 4.0 \text{ m}, T = 6.0 \text{ s}, f = \frac{1}{6} \text{ Hz}, v = -0.67 \text{ m/s}$

(b) Same λ and f . velocity = 0

Problem 17.13 $y_m = 2.25 \text{ cm} \quad \lambda = 7.24 \text{ m}$

$T = 3.8 \text{ s} \quad f = 1/4 = 0.26 \text{ Hz}$

$y = 2.25 \sin 2\pi \left(\frac{x}{7.24} - \frac{t}{3.8} \right)$