# Pages 256 – 257 #13, 14, 19a, 21a, 22, 32

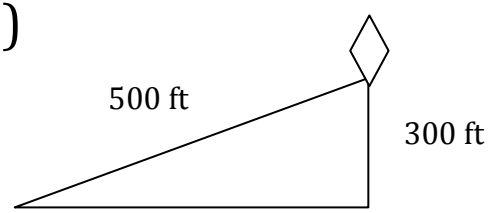
## 13)

$x = \sqrt{51}$ $\quad \frac{dx}{dt} = ?$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = s\frac{ds}{dt}$

$y = 7$ $\quad \frac{dy}{dt} = 0$ $\qquad \sqrt{51}\frac{dx}{dt} + 7(0) = 10(300)$

$s = 10$ $\quad \frac{ds}{dt} = 300$ $\qquad \frac{dx}{dt} = \frac{3000}{\sqrt{51}} \approx 420.084 \text{ mph}$

## 14)




$x = 400$ $\quad \frac{dx}{dt} = 25$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = c\frac{dc}{dt}$

$y = 300$ $\quad \frac{dy}{dt} = 0$ $\qquad 400(25) + 300(0) = 500\frac{dc}{dt}$

$c = 500$ $\quad \frac{dc}{dt} = ?$ $\qquad \frac{dc}{dt} = \frac{10000}{500} = 20 \text{ ft/sec}$

## 19a)

$x = 12$ $\quad \frac{dx}{dt} = 5$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = c\frac{dc}{dt}$

$y = 5$ $\quad \frac{dy}{dt} = ?$ $\qquad 12(5) + 5\frac{dy}{dt} = 13(0)$

$c = 13$ $\quad \frac{dc}{dt} = 0$ $\qquad \frac{dy}{dt} = \frac{-60}{5} = -12 \text{ ft/sec}$

The question asks "how fast", which is a speed. So the answer is that the ladder is moving at a rate of 12 ft/sec down the wall.

# 21a)

$x = 8 \quad \frac{dx}{dt} = ?$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = c\frac{dc}{dt}$

$y = 6 \quad \frac{dy}{dt} = 0$ $\qquad 8\frac{dx}{dt} + 6(0) = 10(-2)$

$c = 10 \quad \frac{dc}{dt} = -2$ $\qquad \frac{dx}{dt} = \frac{-20}{8} = -2.5 \text{ ft/sec}$

The boat is approaching the dock at 2.5 ft/sec

# 22)

$x = 51 = 3(17) \quad \frac{dx}{dt} = 17$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = c\frac{dc}{dt}$

$y = 68 = 4(17) \quad \frac{dy}{dt} = 1$ $\qquad 51(17) + 68(1) = 85\frac{dc}{dt}$

$c = 5(17) = 85 \quad \frac{dc}{dt} = ?$ $\qquad \frac{dc}{dt} = \frac{935}{85} = 11 \text{ ft/sec}$

# 32)

$x = 4 \quad \frac{dx}{dt} = ?$ $\qquad x\frac{dx}{dt} + y\frac{dy}{dt} = c\frac{dc}{dt}$

$y = 3 \quad \frac{dy}{dt} = 0$ $\qquad 4\frac{dx}{dt} + 3(0) = 5(-160)$

$c = 5 \quad \frac{dc}{dt} = -160$ $\qquad \frac{dx}{dt} = \frac{-800}{4} = -200 \text{ mph}$

Since the plane is flying towards the car at 120 mph, the car must be traveling at 80 mph for the horizontal distance to be decreasing at 200 mph.