

Related Rates (Some Even-numbered Problems)

#26 p150



$$a) V = \frac{1}{2}bh(12) = 6h^2 \quad \frac{dh}{dt} = ?$$
$$h = 1 \quad \frac{dV}{dt} = 2$$

$$\frac{dV}{dt} = 12h \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{2}{12(1)} = \frac{1}{6} \text{ ft/min}$$

$$b) \frac{dh}{dt} = \frac{3}{8} \text{ ft./min} \quad \frac{dV}{dt} = ?$$

$$h = 2 \quad = \frac{1}{32} \text{ ft./min}$$

$$\frac{dV}{dt} = 12h \frac{dh}{dt} = 12(2) \left(\frac{3}{8}\right) = 9 \text{ ft}^3/\text{min}$$



when $y = 13$

$$x = \sqrt{169 - 144} = 5$$

$$y^2 = x^2 + 144$$

$$2y \frac{dy}{dt} = 2x \frac{dx}{dt}$$

$$\frac{dy}{dt} = -4$$

$$\left| \frac{dx}{dt} = \frac{y}{x} \frac{dy}{dt} \right.$$

$$= \frac{13}{5} (-4)$$

$$= -10.4 \text{ ft/sec}$$

30 a) (cont'd) Speed of boat increases.

b) $\frac{dx}{dt} = -4$ when $y = 13$, $x = 5$

$$x^2 + 144 = y^2$$

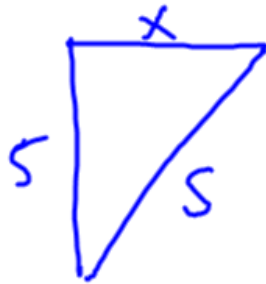
$$2x \frac{dx}{dt} = 2y \frac{dy}{dt}$$

$$\frac{dy}{dt} = \frac{x}{y} \frac{dx}{dt}$$

$$= \frac{5}{13} (-4) = \left(\frac{-20}{13} \frac{\text{ft}}{\text{hr}} \right)$$

$\frac{dL}{dt}$ increases

32)



$$x^2 + 25 = s^2$$

$$2x \frac{dx}{dt} = 2s \frac{ds}{dt}$$

$$\frac{dx}{dt} = \frac{s}{x} \frac{ds}{dt}$$

$$s = 10$$

$$x = \sqrt{100 - 25} \\ = 5\sqrt{3}$$

$$= \frac{10}{5\sqrt{3}} * (-240) = \frac{-480}{\sqrt{3}} \approx -277.13 \text{ mph}$$

34)



$$x^2 + 90^2 = s^2$$

$$2x \frac{dx}{dt} = 2s \frac{ds}{dt}$$

$$\frac{ds}{dt} = \frac{x}{s} \frac{dx}{dt} = \frac{60}{30\sqrt{13}} (28) = \frac{56}{\sqrt{13}} \approx 15.53 \frac{ft}{sec}$$

$$\text{When } x=60, s = \sqrt{8100 + 3600} = \sqrt{11700} = 30\sqrt{13}$$

