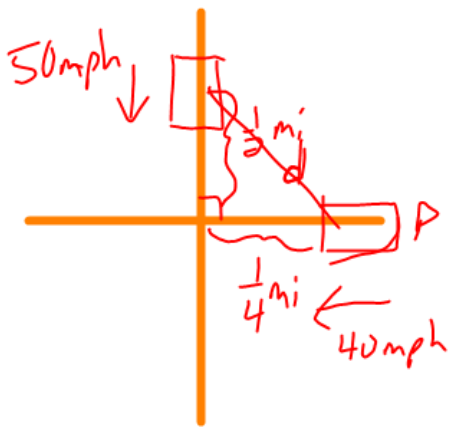

$$\frac{dx}{dt} = x'(t) = -40$$

$$\frac{dy}{dt} = y'(t) = -50$$

$$d^2 = x^2 + y^2$$

$$d = \sqrt{x^2 + y^2}$$

$$d(t) = \sqrt{[x(t)]^2 + [y(t)]^2} = \left([x(t)]^2 + [y(t)]^2\right)^{1/2}$$

$$d'(t) = \frac{1}{\cancel{2}}\left(\cancel{[x(t)]^2 + [y(t)]^2}\right)^{-1/2}\left(\cancel{2}\,x(t)\,x'(t) + \cancel{2}\,y(t)\,y'(t)\right)$$

$$d'(t) = \frac{x(t)x'(t) + y(t)y'(t)}{\sqrt{[x(t)]^2 + [y(t)]^2}}$$

$$d'(t) = \frac{\frac{1}{4}(-40) + \frac{1}{2}(-50)}{\sqrt{\left(\frac{1}{4}\right)^2 + \left(\frac{1}{2}\right)^2}} = \frac{-35}{\frac{\sqrt{5}}{4}} = \frac{-140}{\sqrt{5}} \approx -62.6 \text{ mph}$$

$$\frac{1}{16} + \frac{4}{16}$$

ex 4 $\quad S = 60 - 40e^{-.05x}$ thousand \$

current year

$x'(t)$, $s'(t)$

$s'(4)$

$x'(4) \approx 2$ thousand

$s(t) = 60 - 40e^{-.05x(t)}$

$s'(t) = -40e^{-.05x(t)}\left(-.05x'(t)\right)$

$x(4) = 20$ thousand

$s'(t) = 2x'(t)e^{-.05x(t)}$

$s'(4) = 2x'(4)e^{-.05x(4)}$

$s'(4) = 2(2)e^{-.05(20)}$

$s'(4) = 4e^{-1} \approx \$1.472$ thousand

$\$1472$

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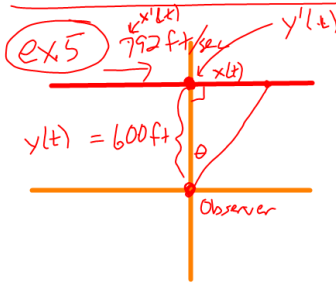
ex 5



$\tan\theta = \frac{x}{y}$

$y(t) = 600$

$y'(t) = 0$

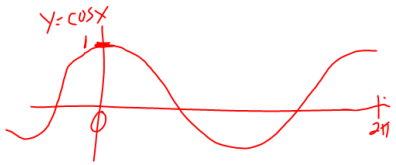
$x'(t) = 792$

$\tan\theta(t) = \frac{x(t)}{y(t)}$

$\left[\sec^2\theta(t)\right]\theta'(t) = \frac{x'(t)y(t) - x(t)y'(t)}{\left[y(t)\right]^2}$

$\frac{540\ \text{mi}}{1\ \text{hr}} \cdot \frac{5280\ \text{ft}}{1\ \text{mi}} \cdot \frac{1\ \text{hr}}{3600\ \text{sec}} = 792\ \text{ft/sec}$

$\left[\sec^2\theta(t)\right]\theta'(t) = \frac{792(600)}{600^2} = 1.32$



$\theta'(t) = \frac{1.32}{\sec^2\theta(t)} = 1.32\cos^2\theta(t)$

max at $\theta = 0$

1.32 rad/sec

1, 5, 7, 9, 15-16, 21, 23