Warm Up

An object is moving back and forth along the x-axis, starting at time $t = 0$. Its position after t seconds is $s(t) = t - 2 - 2\cos t$.
(a) What is the acceleration of the object at time t?
(b) What is the first time at which the velocity will be zero?
(For full credit, you should have no trigonometric functions in your answer; for example, if your answer contains $\sin(\frac{\pi}{4})$ you should know that this is $\frac{1}{\sqrt{2}}$.)

(Binghamton University, 2010)

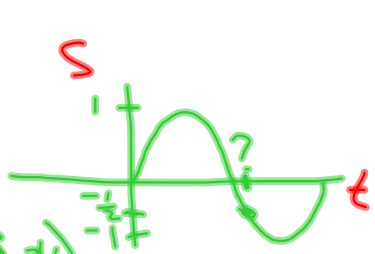
a) $s'(t) = 1 + 2\sin t$ (velocity)

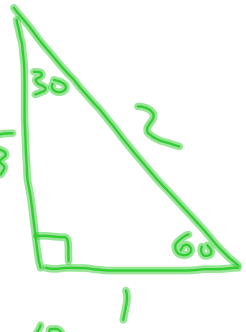
$s''(t) = 2\cos t$ (acceleration)

(b) $1 + 2\sin t = 0$

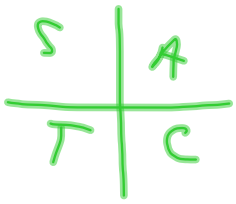
$2\sin t = -1$

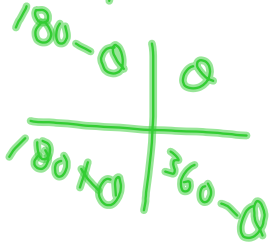
$\sin t = -\frac{1}{2}$





(Ref $\pm$: $\frac{\pi}{6}$, Q3, Q4)





$t_1 = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$ sec

$t_2 = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

8(d) $x^2+y^2=16$

$$2x+2y\frac{dy}{dx}=0$$

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

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

$$\frac{d^2y}{dx^2}=\frac{-1y+x\left(\frac{dy}{dx}\right)}{y^2}$$

$$\frac{d^2y}{dx^2}=\frac{-y+x\left(-\frac{x}{y}\right)}{y^2}$$

$$\frac{d^2y}{dx^2}=\left(\frac{-y^2-x^2}{y}\right)\cdot\frac{1}{y^2}$$

$$=-\frac{(x^2+y^2)}{y^3} \leftarrow x^2+y^2=16$$

$$=-\frac{16}{y^3}$$

Pg. 113

#11 $y = 2x^2 - 3x + 6$

// to $7x + y = 1$

Equal Slope

$y = -7x + 1$

$m = -7$

$y' = 4x - 3$

$4x - 3 = -7$

$\frac{4x}{4} = \frac{-4}{4}$

$x = -1$

$y = 2(-1)^2 - 3(-1) + 6$

$= 11$

$\boxed{(-1, 11)}$

Review Sheet: Applications of Derivatives

Attachments

Worksheet.doc