Lecture 7: Review, implicit differentiation, related rates

Monday, September 21, 2015 10:15 AM

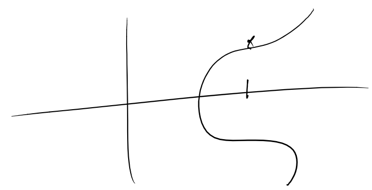
Chain Rule recap:

$$\frac{d}{dx}\left(e^{\sqrt{\frac{\cos x}{1-\sin(\sin x)}}}\right)$$

Implicit

$x=2$

$y=\pm\sqrt{7}$



$$y^2=x^3-1$$

$\frac{dy}{dx}$ at $x=2,\ y=\sqrt{7}$

plug in

$$\frac{d}{dx}(y^2)=\frac{d}{dx}(x^3-1)$$

$$2y\cdot\frac{dy}{dx}=3x^2 \longrightarrow \frac{dy}{dx}=\frac{3x^2}{2y}=\frac{3\cdot 4}{2\sqrt{7}}=\frac{6}{\sqrt{7}}$$

$$y^3+y-e^y=xy+\sin x-1$$

$x=0$

$y=0$

find $\frac{dy}{dx}$ at $x=0, y=0$

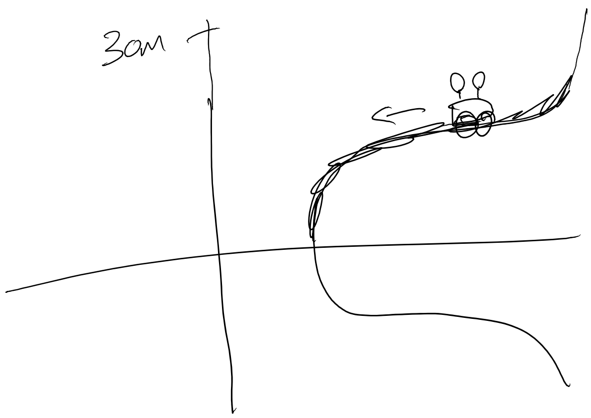
$$\frac{d}{dx}(y^3+y-e^y)=\frac{d}{dx}(xy+\sin x-1)$$

$$3y^2\frac{dy}{dx}+\frac{dy}{dx}-\frac{dy}{dx}e^y=x\frac{dy}{dx}+y+\cos x$$

$$3y^2\frac{dy}{dx} + \frac{dy}{dx} - \frac{dy}{dx}e^y - x\frac{dy}{dx} = y + \cos x$$

$$\frac{dy}{dx}\left(3y^2+1-e^y-x\right) = y+\cos x$$

$$\frac{dy}{dx} = \frac{y+\cos x}{3y^2+1-e^y-x}$$ $0 = x = y \Rightarrow \frac{1}{0}$!! vertical tangent?



$y^2 = x^3 - 1$

$y = \sqrt{7}$ $x = 2$

$\frac{d^2y}{dt^2}$

save this

$200\ cm^3/sec$ how fast is the radius changing when it is 10 cm.

how fast is surface area changing?

$$V = \frac{4}{3}\pi r^3$$

want: $\frac{dr}{dt}$ $\frac{dV}{dt} = \frac{d}{dt}\left(\frac{4}{3}\pi r^3\right)$

$$\frac{dr}{dt} = \frac{\left(\frac{dV}{dt}\right)}{4\pi r^2} = \frac{200}{4\pi (10)^2}$$

$$= 3r^2 \frac{dr}{dt} \cdot \frac{4}{3}\pi$$

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$