Inverse Trig Functions

$$y = \sin^{-1}(x) \rightarrow x = \sin(y)$$

$$\frac{dy}{dx} = ?$$

$$\frac{d}{dx} x = \frac{d}{dx} \sin(y)$$

$$\frac{da}{dx} = 0$$ because a = constant

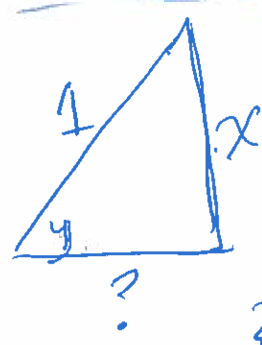
$$\frac{d}{dx} t = \frac{dt}{dx}$$ because t = variable.

$$\frac{d}{dx} \sin(t) = \cos(t) \cdot \frac{dt}{dx}$$

chain Rule

$$1 = \cos(y) \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{1}{\cos(y)}$$

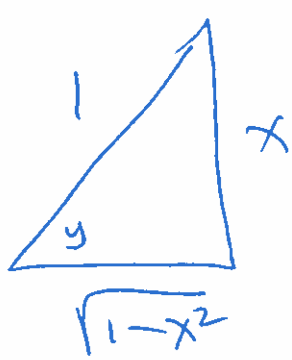


$$\sin y = \frac{x}{1} \quad \frac{opp}{hyp}$$

$$?^2 + x^2 = 1$$

$$?^2 = 1 - x^2$$

$$? = \pm\sqrt{1-x^2}$$



$$\cos y = \frac{adj}{hyp} = \frac{\sqrt{1-x^2}}{1}$$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$$

(★) $$\frac{d}{dx} \sin^{-1}(x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\cos^{-1}(x) = -\frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\tan^{-1}(x) = \frac{1}{1+x^2}$$

Ex $y = \ln x$

$$x = e^y$$

Implicit Diff

$$1 = e^y \, dy/dx$$

$$e^{-y} = dy/dx$$

$$e^{-\ln x} = dy/dx$$

$$e^{\ln x^{-1}} = dy/dx$$

$$x^{-1} = dy/dx$$

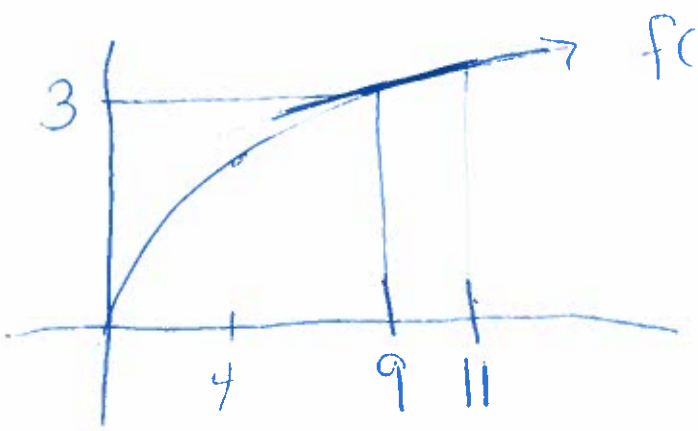
Ex $y = \cosh^{-1}(x)$

$$\cosh(y) = x$$

$$\sinh(y)\frac{dy}{dx} = 1$$

$$dy/dx = \frac{1}{\sinh(y)}$$

Linearize a Function



Find a nearby point (center)

$a = 9$ Point $(9, 3)$

Slope of tangent Line $\frac{dy}{dx}$ at $X = 9$

$$f(x) = x^{1/2}$$

$$f'(x) = \frac{1}{2} x^{-1/2} \qquad f'(9) = \frac{1}{2} 9^{-1/2} = \frac{1}{6}$$

$$\frac{1}{2}\frac{1}{3} = \frac{1}{2}\frac{1}{9^{1/2}}$$

Equation of Line

$$Y = Y_1 + m(X - X_1)$$

$$Y = 3 + \frac{1}{6}(X - 9)$$

$$Y(11) = 3 + \frac{1}{6}(11 - 9) = 3\frac{1}{3}$$

Real Life

$$\sin([H^+]) \approx [H^+]$$

small ≈ 0

$f(x) = \sin x \qquad f(0) = 0$

$f'(0) = \cos(0) = 1$

Point $(0,0)$ Slope $= 1$

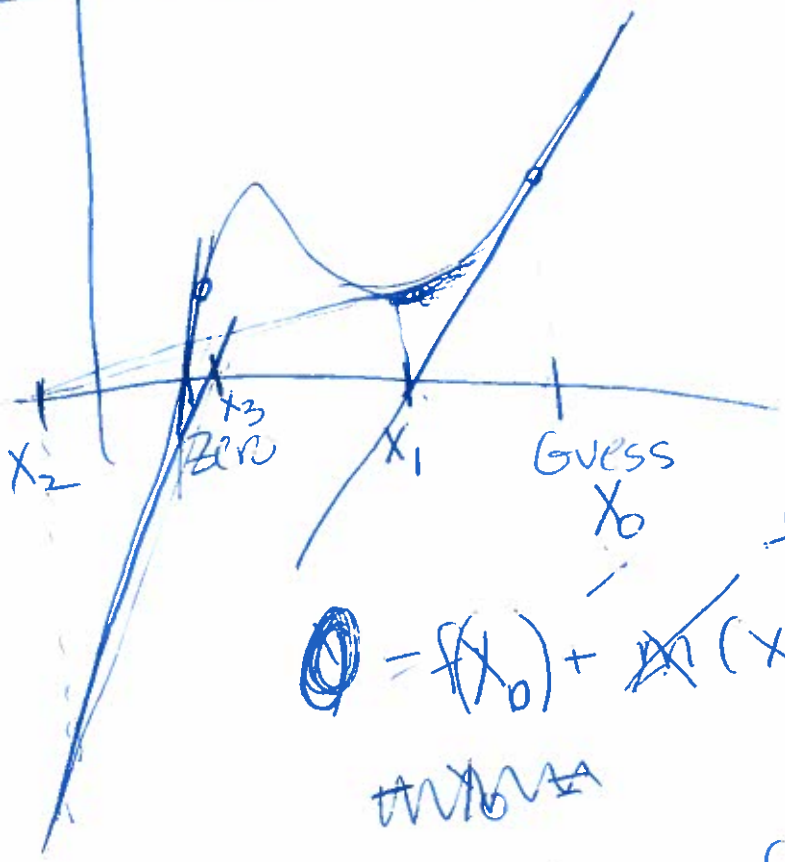
$$y = 1x$$

$\sqrt[3]{29} \approx \sqrt[3]{27}$ center 27

$\ln(1.01) \approx \ln(1)$ center 1

$e^{.05} \approx e^0$ center 0

Newtons Method for finding zeros



$$0 = f(x_0) + f'(x_0)(x - x_0)$$

$$-\frac{f(x_0)}{f'(x_0)} = \frac{f'(x_0)(x - x_0)}{f'(x_0)}$$

$$-f(x_0)/f'(x_0) = x - x_0$$

$$x_1 = x_0 - f(x_0)/f'(x_0)$$

Y_1 = cubic Regression

2010 STO X
Guess

$X - Y_1 / \text{nderiv}(Y_1, X, X)$

$X_0 = 2010$

$X_1 = 1985$

$X_2 = 1976$

$X_3 = 1960$

∴

Ans 1960.408...

GROUP NAME: Fluffy Ponies

Date: 2/27/14

Student Names (First and Last)

Speaker/Presenter: Ahmed / Milton

Writer/Prep: Courtney

Leader/Collaborator: Tyler / June

Independant Variable (x-axis): income

Dependant Variable (y-axis): crime rate

Conclusion (in words):

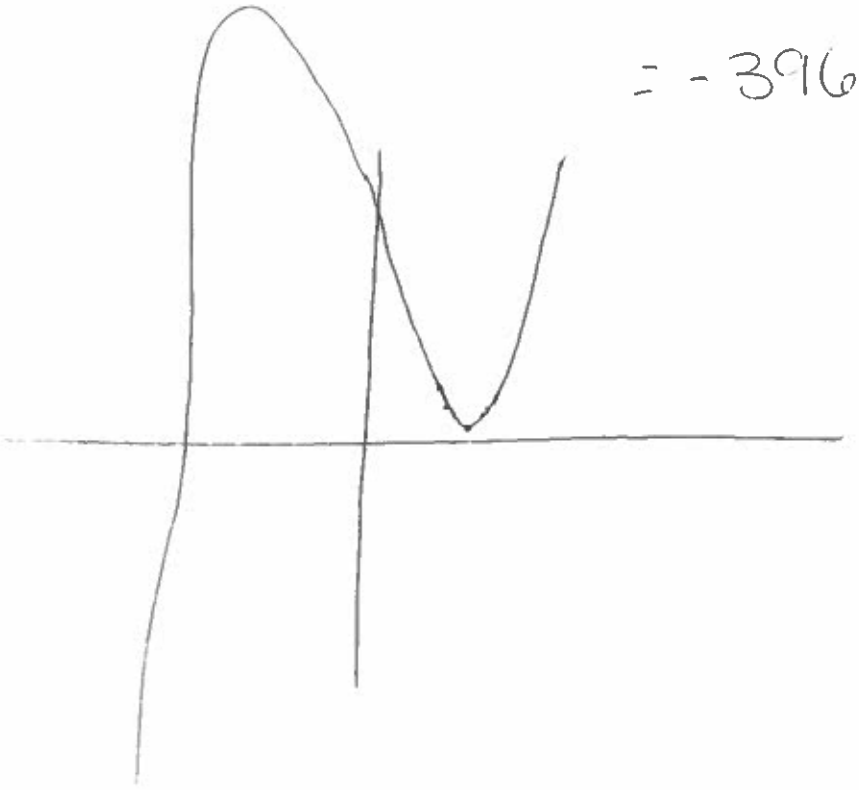
At $-396.02... k per year, you have a 0% chance of committing a crime

Supporting Work:

$X \to 60$

$X - Y_1 / nDeriv(Y_1, X, X) \to X \quad (X\,15)$

$= -396.0255...$



GROUP NAME: W.H.O

Date: 2/27/13

Independant Variable (x-axis): Years

Dependant Variable (y-axis): Steroids lvl. (PPM)

Student Names (First and Last)

Speaker/Presenter: Chen Lin, Michael

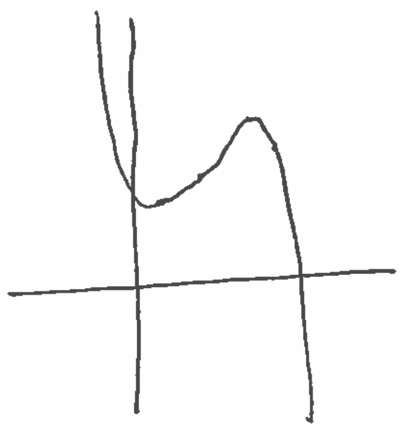
Writer/Prep: Catherine, Kathleen

Leader/Collaborator: Jena

Conclusion (in words):

2014 around X-mas there will be no steroids.

Supporting Work:



$$x - Y_1 ./ nDerv(y_1, x_1, x) \to X$$

$$= 14.96$$

GROUP NAME: Porter's minions

Date: 2/27/14

Student Names (First and Last)

Speaker/Presenter: Jason

Writer/Prep: Jenn

Leader/Collaborator: Dallen/ Kero

Independant Variable (x-axis): years

Dependant Variable (y-axis): tuition ~~price~~ price

Conclusion (in words):

In the year 2231 the tuition price will be $0.

Supporting Work:

$y_1 = -.083 \cdot x^3 + 20\,999.. x^2 + -417.916... x + 5464.199..$

$x \to 2014$

$x - y_1 / nDeriv(y_1, x, x) \to x$

$= 231.565$

(2231)