Wednesday, February 14, 2018 9:00 AM

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

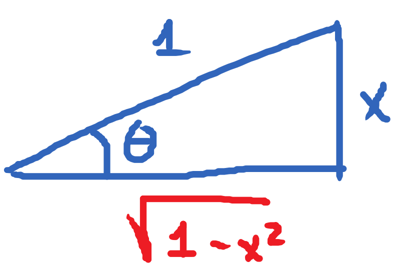
Let $g(x) = \arcsin x$. Find $g'(x)$

$f(x) = \sin x. \longrightarrow f'(x) = \cos x$

By I.F.T.

$$g'(x) = \frac{1}{f'(g(x))} = \frac{1}{\cos(\arcsin x)}$$

let $\underbrace{\arcsin x = \theta}$. Goal : $\cos(\theta) = ?$



$\sin\theta = \frac{x}{1}$

So, $\cos(\theta) = \cos(\arcsin x) = \sqrt{1-x^2}$

Ex. Show that the formulas below are true.

(1) $\dfrac{d}{dx}(\arccos x) = \dfrac{-1}{\sqrt{1-x^2}}$.

(2) $\dfrac{d}{dx}(\arctan x) = \dfrac{1}{1+x^2}$.

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(2) Let $g(x) = \arctan x$. Find $g'(x)$?

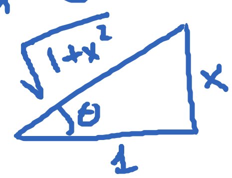
$f(x) = \tan x. \longrightarrow f'(x) = \sec^2 x$

By IFT. $g'(x) = \dfrac{1}{f'(g(x))}$

$= \dfrac{1}{\sec^2(\arctan x)}$

$\sec(\boxed{\arctan x}) \stackrel{?}{=}$

Let $\theta = \arctan x$. $\tan\theta = x$



$\sec(\theta) = \sqrt{1+x^2}$

Wednesday, February 14, 2018 9:42 AM

Summary:

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

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

$$\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}.$$

E.x. 1 Find $\frac{dy}{dx}$.

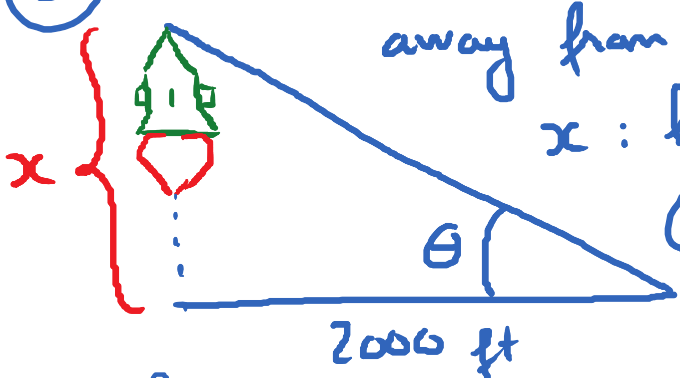
a) $y = \arctan(x^2)$.

b) $y = \cos^{-1}(3x-1)$

c) $y = x^2 \cdot \sin^{-1}(x)$.

2 Television camera is located 2000 ft away from the launching pad of a rocket.

x : height of the rocket (changing)



a) Write θ as a function of x

b) Find $\frac{d\theta}{dx}$. And evaluate it when the rocket is 5000 ft away from the camera.

Wednesday, February 14, 2018 10:13 AM

$$\frac{d}{dx}\left(\sqrt{f(x)+g(x)}\right) = \frac{1}{2\sqrt{f(x)+g(x)}} \cdot \underbrace{\left(f'(x) + g'(x)\right)}_{11}$$