Math 1431

Section 16679

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Questions?

Popper 15

1. $\dfrac{d}{dx}(\ln 2x) =$

Logarithmic differentiation - using properties of logs to expand in order to make taking derivatives easier.

Ex:

$$y = \frac{(x+3)^4}{(x^4+12)\sqrt{x^2+5}}$$

Ex. Find y': $y = \ln\left(\dfrac{(x^2+3)^3}{(x-4)\sqrt{x^3+x}}\right)$

Change of base formula: $\log_a x = \dfrac{\ln x}{\ln a}$

So, how would we find the derivative of a log function with base a?

$y = \log_a x$

$y = \log_a u$

Mixed examples: Find the derivative of each.

1. $y = 5^{3x^2}$
2. $y = \dfrac{\ln(\cos x)}{2}$
3. $y = \log_2(\cos x)$

4. $y = \log_5(\tan x)$

5. $y = \ln(\sin \sqrt{x})$

Another one:

$$y = (\cos x)^{3x^4+2x}$$

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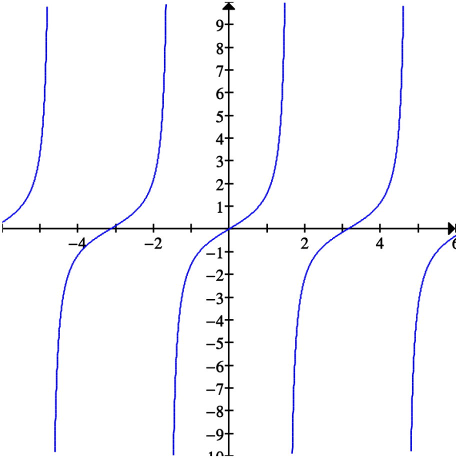
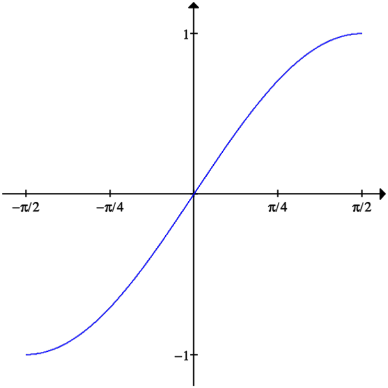
2. Let $f(x) = 2x + \ln x$, find $\left(f^{-1}\right)'(2)$.

$f(x) = \tan(x)$ on the interval $[-6, 6]$:

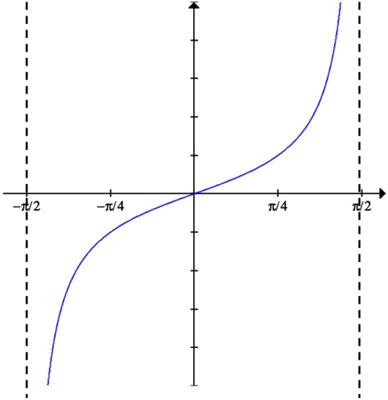


Is this an invertible function?

Restricted versions of these functions:



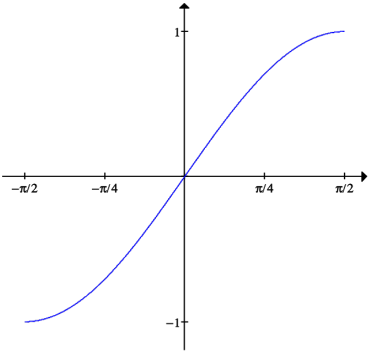
$f(x) = \sin(x),\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$



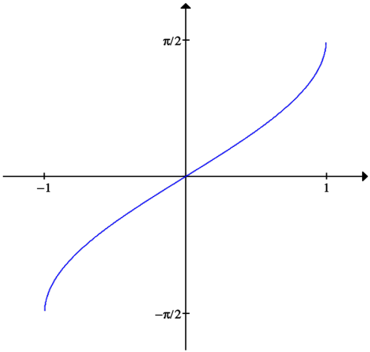
$f(x) = \tan(x),\ \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

These ARE invertible functions!

Let $f(x) = \sin(x),\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$. This function is invertible and we denote its inverse as $\sin^{-1}(x)$ or $\arcsin(x)$.

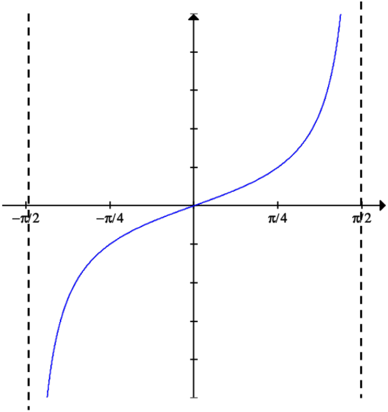


$f(x) = \sin(x),\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

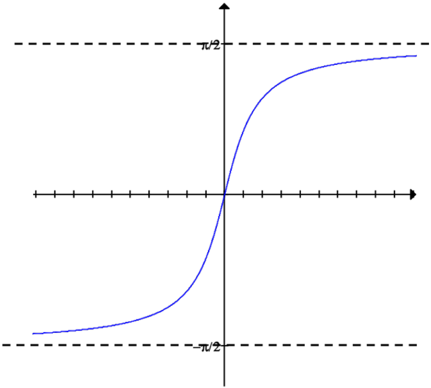


$g(x) = \arcsin(x),\ [-1, 1]$

Let $f(x) = \tan(x),\ \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$. This function is invertible and we denote its inverse as $\tan^{-1}(x)$ or $\arctan(x)$.



$f(x) = \tan(x),\ \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$



$g(x) = \arctan(x),\ (-\infty, \infty)$

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3. In right triangle ABC, with right angle at B, AB = x, AC = 1. Find BC.

If $y = \operatorname{arcsec}\left(\dfrac{\sqrt{5}}{2}\right)$, find $\tan(y)$.

$\sin(\operatorname{arcsec}(x)) =$

$$\sin\left(2\arccos\left(\frac{4}{5}\right)\right) =$$

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4. $\cos\left(\arcsin\left(\frac{5}{13}\right)\right) =$

If $y = \arcsin(x)$, find $\sin(y)$, $\cos(y)$ and y'.

If $y = \arctan(x)$, find y'.

If $y = \text{arcsec}(x)$, find y'.

Formulas (u is a function of x):

$$\frac{d}{dx}[\sin(u)] = \frac{u'}{\sqrt{1-u^2}}$$

$$\frac{d}{dx}[\tan(u)] = \frac{u'}{1+u^2}$$

$$\frac{d}{dx}[\sec(u)] = \frac{u'}{|u|\sqrt{u^2-1}}$$

Examples: Give the domain of $f(x) = \arctan(\ln(x))$ and compute its derivative.

Give the domain of $g(x) = \arcsin\left(\frac{e^x}{2}\right)$ and find the equation for the tangent line to the graph of this function at $x = 0$.

Differentiate $y = \tan^{-1} \sqrt{x}$

Differentiate $f(x) = exp(\arctan(x))$

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5. Find the derivative of $f(x) = \arcsin(3x)$.

To Do

Read 4.2 - 4.4.

Take quiz 16 & 17.

Email me questions if you have any.

Watch videos for 10/24 and answer EMCF Poppers before 10/29.