Math 1431

Section 15717
TTh 10-11:30am 100 SEC

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Office Hours:
M & Th noon – 1:00 pm & T 1:00 – 2:00 pm
and by appointment
What have we learned so far in chapter 4?

More fun stuff......
4.4 Inverse Trigonometric Functions

\[ f(x) = \sin x \text{ on the interval } [-10, 10] \]

Is this an invertible function?
$f(x) = \tan x$ on the interval $[-6, 6]$

Is this an invertible function?
Restricted versions of these functions.

\[ f(x) = \sin x \text{ on } \left[ \frac{-\pi}{2}, \frac{\pi}{2} \right] \quad \text{and} \quad f(x) = \tan x \text{ on } \left( \frac{-\pi}{2}, \frac{\pi}{2} \right) \]

These \textbf{ARE} invertible functions.
Let \( f(x) = \sin(x) \) for \( x \in \left[ -\frac{\pi}{2}, \frac{\pi}{2} \right] \). This function is invertible and we denote its inverse by \( \sin^{-1}(x) \) or \( \arcsin(x) \).
Let $f(x) = \tan(x)$ for $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$. This function is invertible and we denote its inverse by $\tan^{-1}(x)$ or $\arctan(x)$. 

\begin{align*}
\tan(x) \text{ on } \left(\frac{-\pi}{2}, \frac{\pi}{2}\right) & \quad \text{arctan}(x) \text{ on } (-\infty, \infty)
\end{align*}
<table>
<thead>
<tr>
<th>Function</th>
<th>Domain</th>
<th>Range</th>
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From PreCalculus:

\[ \sin \frac{\pi}{3} = \sin^{-1} \frac{\sqrt{3}}{2} = \]

\[ \sin \frac{\pi}{6} = \sin^{-1} \frac{1}{2} = \]

\[ \sin \frac{\pi}{4} = \sin^{-1} \frac{1}{\sqrt{2}} = \]

\[ \sin \frac{2\pi}{3} = \sin^{-1} \frac{\sqrt{3}}{2} = \]

\[ \sin \frac{4\pi}{3} = \sin^{-1} -\frac{\sqrt{3}}{2} = \]
If $y = \arcsin x$  

a) find $\sin y$ 

b) find $\cos y$ 

c) find $y'$
Popper 15

1. In the given right triangle, $BC =$

2. $\sin^{-1}\left(\sin\frac{\pi}{6}\right) =$

\[ y = \arcsin x \quad \text{find } \cos y \]

\[ y = \arccsc \frac{\sqrt{5}}{2} \quad \text{find } \tan y \]

\[ \sin(\arccsc x) = \]
\[
\cos\left(2 \arcsin \frac{3}{5}\right) = \\
\sin\left(2 \arccos \frac{4}{5}\right) = 
\]
Poppers:

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

5. \[ \sec\left(\arctan (3x)\right) = \]
\[ f(x) = y = \arctan x \quad \text{find } y' \]

\[ f(x) = y = \text{arcsec } x \quad \text{find } y' \]
Formulas (u is a function of x):

\[ \frac{d}{dx}[\arcsin u] = \frac{u'}{\sqrt{1-u^2}} \]

\[ \frac{d}{dx}[\arctan u] = \frac{u'}{1+u^2} \]

\[ \frac{d}{dx}[\text{arcsec} u] = \frac{u'}{|u|\sqrt{u^2-1}} \]
Give the domain of \( f(x) = \arctan(\ln(x)) \) and compute its derivative.
Give the domain of $g(x) = \arcsin \frac{e^x}{2}$ and find the equation for the tangent line to the graph of this function at $x = 0$. 
Differentiate: \( y = \tan^{-1} \sqrt{x} \)
Differentiate: \( f(x) = e^{\tan^{-1} x} \)
Differentiate: \( y = \sin^{-1} \sqrt{x^2 + 2} \)
Given $f(x) = \arcsin(e^x)$

a) Find the domain
b) Find the points where the function has horizontal tangent lines (if any)
c) Find the intervals on which the function is increasing
6. Give the derivative of \( f(x) = \arctan(3x) \).

7. Give the derivative of \( f(x) = \arcsin(3x) \).

8. Give the slope of the tangent line to the graph of \( f(x) = \arctan(4 - 2x) \) at \( x = \frac{3}{2} \).