MA1A31

Example of Quiz 5 (A9 & A10) **Mark:_____/25**

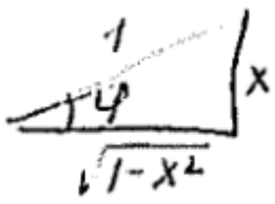
Last Name:_____ **First Name:_____** **Student #:_____**

[4 + 4 points] Differentiate the following functions using differentiation rules. State the intervals where the formulas you obtain are valid.

1. $f(x) = \sin(\arcsin(x))$

$f'(x) = \cos(\arcsin x) \cdot (\arcsin x)' =$

$= \cos(\arcsin x) \cdot \frac{1}{\sqrt{1-x^2}} =$



$= \sqrt{1-x^2} \cdot \frac{1}{\sqrt{1-x^2}} = 1.$

or: $f(x) = h \circ p$, where $h(x) = \sin x$
$p(x) = \arcsin x = \sin^{-1} x$

$f(x) = \sin x \circ \sin^{-1} x = x$

$f'(x) = (x)' = 1$ $\quad \arcsin x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \Rightarrow x \in [-1, 1]$

2. $f(x) = \frac{\sinh^{-1} x}{\cosh^{-1} x}$

$f'(x) = \frac{\cosh^{-1} x \cdot \frac{1}{\sqrt{1+x^2}} - \sinh^{-1} x \cdot \frac{1}{\sqrt{x^2-1}}}{(\cosh^{-1} x)^2} =$

$= \frac{\sqrt{x^2-1}\cosh^{-1} x - \sqrt{1+x^2}\sinh^{-1} x}{\sqrt{x^4-1}(\cosh^{-1} x)^2}$

$\operatorname{arcsinh} x \in (-\infty, \infty)$

$\operatorname{arccosh} x \in [1, \infty)$

$x \in (1, \infty)$

3. [5 points] Sketch a labeled graph of a function f that satisfies the given description: f is defined on [-3, 3] such that f is continuous everywhere except at 1, differentiable everywhere except at 1, and fails to satisfy the conclusion of the mean value theorem with a = -3 and b = 3.