Week 8: Differentiation of Inverse Trigonometric Functions and Logarithmic Functions

Welcome to the Weekly Review for MATH 2413. This week’s review talks about Differentiation of Inverse Trigonometric Functions and Logarithmic Functions. We would like to thank Patrick Bourque and the Fall 2014 MATH 2413 students for allowing us to film the Weekly Reviews.

The following problems are presented in the Week 8 videos. Thank you!

Part A: Differentiation of Inverse Trigonometric Functions

1. Find \( \frac{dy}{dx} \) implicitly for \( y = \arctan(x) \)

2. Differentiation Rules for Inverse Trigonometric Functions.
3. Find $y'$ for $xy = \arctan(y)$

4. Find $f'(x)$ for $f(x) = \sqrt{1-e^{2x}} \arcsin(e^x)$

5. Find $f'(x)$ for $f(x) = x^3 \text{arcsec}(e^x)$
6. Let \( f(x) = \arctan(x) + \arctan\left(\frac{1}{x}\right) \)

(a) Show \( f'(x) = 0 \)

(b) Find \( c \) such that \( f(x) = c \) for \( x \neq 0 \)
7. Let \( f(x) = -2 \arctan\left(\sqrt{\frac{x}{1+x^2}}\right) + \arccos(x) \)

(a) Show \( f'(x) = 0 \)

(b) Find \( c \) such that \( f(x) = c \)
Part B: Differentiation of Logarithmic Functions

1. Find $\frac{dy}{dx}$ for each of the following functions

(a) $y = \arctan(x^2) \ln(1 + x^4)$

(b) $y = \ln \left( \sqrt{x^3 \sin(x)} \right)$
(c) \( y = \ln \left( \frac{x^2 e^x}{\tan(x)} \right) \)

(d) \( y = x \sin(x) \)
(e) $y = (x^2 + 1)^{\arctan(x)}$

2. Find equation of the tangent line to $x^y = y^x$ at (1,1)