1. Implicit Differentiation

(1) Find the line tangent to the curve \( y^2 = 4x^3 + 2x \) at the point \((2, 6)\).

(2) (Final, 2015) Let \( xy^2 + x^2y = 2 \). Find \( \frac{dy}{dx} \) at the point \((1, 1)\).

(3) (Final 2012) Find the slope of the line tangent to the curve \( y + x \cos y = \cos x \) at the point \((0, 1)\).

(4) Find \( y'' \) (in terms of \( x, y \)) along the curve \( x^5 + y^5 = 10 \) (ignore points where \( y = 0 \)).

(5) Find \( y' \) if \( (x + y) \sin(xy) = x^2 \).
2. INVERSE TRIG FUNCTIONS

(1) Evaluation
(a) (Final 2014) Evaluate \( \arcsin \left( -\frac{1}{2} \right) \); Find \( \arcsin \left( \sin \left( \frac{31\pi}{11} \right) \right) \).

(b) (Final 2015) Simplify \( \sin(\arctan 4) \)

(c) Find \( \tan(\arccos(0.4)) \)

(2) Differentiation
(a) Find \( \frac{d}{dx} (\arcsin (2x)) \)

(b) Find the line tangent to \( y = \sqrt{1 + (\arctan(x))^2} \) at the point where \( x = 1 \).

(c) Find \( y' \) if \( y = \arcsin \left( e^{5x} \right) \). What is the domain of the functions \( y, y' \)?