

THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Applied Mathematics

Lightboard Project

4. Differentiation by First Principle and Differentiation Rules

4.1 Find $f'(x)$ for $f(x) = 3^x \tan x$. [18191 Test2]

4.2 Find $f'(x)$ for $f(x) = \frac{\ln x}{x+1}$. [18191 Test2]

4.3 Find $f'(x)$ for $f(x) = 4^x - x^3 + e^3$. [18192 Test2]

4.4 Find $f'(x)$ for $f(x) = \frac{\arctan x}{x + \sin x}$. [18192 Test2]

4.5 Find $f'(x)$ for $f(x) = (e^{-2x} + x^\pi + \pi^x + \log_5 x)^2$. [19201 Test2]

4.6 Find $f'(x)$ for $f(x) = x^{2x}$. [19201 Test2]

4.7 Find $f'(x)$ for $f(x) = (x^2 + 1)^{\arctan x} \cdot \cos x$.

4.8 Find $f'(x)$ for $f(x) = \arcsin\left(\frac{1}{e^{x^2} + 1}\right)$.

4.9 Find $f'(0)$ by first principle (from the definition) for the following function

$$f(x) = \begin{cases} e^{-x^2} \tan^{-1}\left(x + \frac{\pi}{4}\right) \frac{\sin^2 x}{x} + 5, & \text{if } x \neq 0, \\ 5, & \text{if } x = 0. \end{cases}$$

[19202 Test2]

4.10 Find $\frac{d}{dx}(\sec x)$ by first principle (from the definition). [18192 Test2]