

THE HONG KONG POLYTECHNIC UNIVERSITY

Department of Applied Mathematics

Lightboard Project

8. Linear Approximation

8.1 Let $f(x) = \ln(\sqrt{x})$, $x > 0$. Write the linear approximation of $f(x)$ around $a = 1$ and hence estimate the value of $\ln(\sqrt{1.02})$. [18192 Exam]

8.2 Find the linear approximation of $f(x) = \arccos(x) = \cos^{-1}(x)$ at the point $x = 0$. Hence approximate the value of $\arccos(0.1) = \cos^{-1}(0.1)$.

[16172 Exam]

8.3 Suppose the equation $e^{3y} = x^3y$ defines a differentiable function $y = f(x)$. Write the linear approximation for $f(x)$ around $a = e$ and use this to approximate $f(3)$. [15162 Exam]

8.4 Let $f(x) = \frac{\tan^{-1} x}{1+x} + 1$. Find the linear approximation of $f(x)$ at $x = 0$. Hence estimate $f(-0.01)$. [18191 Test2]

8.5 Define $h(x) = \frac{x + \sinh(2x)}{\cosh(3x)}$. Approximate $h(x)$ by a linear function near $x_0 = 0$. Hence find the approximate value of $h(0.12)$. [14151 Exam]