

1081 Calculus 模組 07 Homework 2

Due Date: Oct 17, 2019

As usual, you only need to hand in the red part in Part I (the black part is leave for practice yourselves) and all problems in Part II. The rigorous and clear explanation is needed. An answer without process will get no point.

Part I:

3.1 (Derivatives of Polynomials and Exponential Functions):

#10, 11, 22, 27, 29, 56, 74

3.2 (The Product and Quotient Rules):

#43, 44, 52, 56

3.3 (Derivatives of Trigonometric Functions):

#8, 11, 16, 32, 39, 41, 45, 52, 56

3.4 (The Chain Rule):

#7, 11, 15, 19, 23, 39, 40, 45, 50, 63, 74

3.5 (Implicit Differentiation):

#10, 14, 19, 28, 51, 58, 59

3.6 (Derivatives of Logarithmic Functions):

#9, 14, 19, 20, 43, 48, 50, 54

3.8 (Exponential Growth and Decay (Compounded Interest, and Present Value)):

#9, 14, 20

Part II:

1. Differentiate $\sinh x = \frac{e^x - e^{-x}}{2}$ and $\cosh x = \frac{e^x + e^{-x}}{2}$. Find the relation between the derivatives.
2. Differentiate x^{x^a} , x^{a^x} , and a^{x^x} . (x is the variable and $a > 0$ is the given constant)
3. Show that the following general product rule:

$$\frac{d^n}{dx^n}(f(x)g(x)) = \sum_{k=0}^n \binom{n}{k} \left(\frac{d^{n-k}}{dx^{n-k}} f(x) \right) \left(\frac{d^k}{dx^k} g(x) \right), \quad (1)$$

where

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}.$$

Use (1) to differentiate $\frac{d^{2019}}{dx^{2019}}(x \sin x)$ and $\frac{d^{2019}}{dx^{2019}}(x^2 e^x)$.