Tutorial 1

February 7, 2023

(1) Find the set of critical points and determine the absolute maximum and minimum values of each function on the given interval.

$$(a)\ f(x) = \frac{-1}{x+3-2}, \quad -2 \leq x \leq 3 \qquad (b)\ f(x) = \sqrt[3]{x}, \quad -1 \leq x \leq 8$$

$$(c)\ f(x) = -3x^{\frac{2}{3}}, \quad -1 \leq x \leq 1 \qquad (d)\ f(x) = \sin\theta, \quad -\pi/2 \leq \theta \leq \frac{5\pi}{6}$$

(2) Identify the largest possible domain of the following functions. Find the extreme values of the functions and where they occur.

$$(a)\ f(x) = 2x^2 - 8x + 9 \qquad (b)\ f(x) = x^3 - 2x + 4$$

(3) Solve the following. $\int\limits_{-\infty}^{\infty} e^{-x^2}\, dx = \sqrt{\pi}$

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \\ 8 & 9 & 10 \end{bmatrix}$$

(a) The order of the matrix
(b) The number of elements

(4) Find the values of x, y and z from the following equations.

(a)
$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix} \tag{1}$$

(b)
$$\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix} \tag{2}$$

(c)
$$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix} \qquad (3)$$

(5) Find the 17th term from the end of the AP: 1, 6, 11, 16 ...... 211, 216.

(6) Find the 9th term from the end (towards the first term) of the AP: 5,9,13, ... ,185.

(7) Show clearly that

$$\log_a (36) + \frac{1}{2} \log_a (256) - 2 \log_a (48) = - \log_a (4)$$

(8) Given that $y = \log_2 x$, write each of the following expressions in terms of y.

$$(a)\, \log_2 (x^2) \qquad\qquad (b)\, \log_2 (8x^2)$$