2021-22 First Semester
MATH1083 Calculus II (1002&1003)

Assignment 9

Due Date: 2pm 28/Apr/2021(Friday). [Please pay attention to the deadline]

- Write down your **Chinese name** and **student number**. Write neatly on **A4-sized** paper and **show your steps**.
- **Late submissions or answers without details will not be graded.**

1. Use **definition** to find $f_x(x, y)$ and $f_y(x, y)$ for
$$f(x, y) = xy^2 - x^3y$$

2. If $f(x, y) = \sqrt[3]{x^3 + y^3}$,
   (a) find $f_x(x, y)$.
   (b) find $f_x(0, 0)$ and $f_y(0, 0)$.

3. Determine the set of points at which the function is continuous
$$f(x, y) = \begin{cases} \frac{xy}{x^2+xy+y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

4. Find the equation of the tangent plane to the surfaces at the specified points P:
   (a) $z = x \sin(2x + y)$, $P = (1, -1, \sin 1)$
   (b) $xy + yz + zx = 11$, $P = (1, 2, 3)$

5. Find all the second partial derivatives of function $f(x, y) = \ln(x^2 - y^2)$

6. Use implicit differentiation to find $\partial z/\partial x$ and $\partial z/\partial y$ for
$$e^z = xyz$$

7. Find the directional derivative of $f = \sin xe^{2y}$ at the point $P = (0, 0)$ in the direction of the point $Q = (1, 1)$ and find the direction in which the function changes fastest at the point $R = (0, 1)$.

8. Find the absolute maximum and minimum values of $f(x, y) = 4x^2 - 2xy + 6y^2 - 8x + 2y + 3$ on the set $D = \{(x, y) \,|0 \leq x \leq 2, -1 \leq y \leq 3\}$

9. Use the method of Lagrange multipliers to find the minimum value of
$$f(x, y) = xy$$
subject to the constraint
$$g(x, y) = 4x^2 + y^2 - 8 = 0$$