MATH 104: HOMEWORK 4

DUE DATE: IN CLASS – WEDNESDAY, MARCH 13, 2024

Fulbright University, Ho Chi Minh City, Vietnam

Problem 1. Find an equation of the tangent plane to the given surface at the specified point.

(1) $z = 2x^2 + y^2 - 5y, (1, 2, -4)$
(2) $z = e^{x-y}, \quad (2, 2, 1)$
(3) $z = x/y^2, (-4, 2, -1)$
(4) $z = x\sin(x + y), \quad (-1, 1, 0)$
(5) $z = \ln(x - 2y), \quad (3, 1, 0)$

Problem 2. Verify the linear approximation at $(0, 0)$ of the following

(1) $e^x \cos(xy) \approx x + 1$
(2) $\frac{y-1}{x+1} \approx x + y - 1$

Date: March 5, 2024.

Problem 3. The wave heights h in the open sea depend on the speed v of the wind and the length of time t that the wind has been blowing at that specd. Values of the function $h = f(v, t)$ arc recorded in feet in the following table. Use the table to find a linear approximation to the wave height function when v is near 40 knots and t is near 20 hours. Then estimate the wave heights when the wind has been blowing for 24 hours at 43 knots.

Duration (hours)

Wind speed (knots) v \ t	5	10	15	20	30	40	50
20	5	7	8	8	9	9	9
30	9	13	16	17	18	19	19
40	14	21	25	28	31	33	33
50	19	29	36	40	45	48	50
60	24	37	47	54	62	67	69

Problem 4. If R is the total resistance of three resistors, connected in parallel, with resistances R_1, R_2, R_3, then

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

If the resistances are measured in ohms as $R_1 = 25\Omega$, $R_3 = 40\Omega$, and $R_3 = 50\Omega$, with a possible error of 0.5% in each case, estimate the maximum error in the calculated value of R.