Math 2210 - Assignment 7

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1 Sections 12.7 through 12.8

1.1 Section 12.7

12.7.1 Find the equation of the tangent plane to the surface:

$$x^2 + y^2 + z^2 = 16$$

at the point $(2, 3, \sqrt{3})$.

12.7.4 Find the equation of the tangent plane to the surface:

$$x^2 + y^2 - z^2 = 4$$

at the point $(2, 1, 1)$

12.7.7 Find the equation of the tangent plane to the surface:

$$z = 2e^{3y}\cos(2x)$$

at the point $(\pi/3, 0, -1)$.

12.7.11 Use the total differential dz to approximate the change in

$$z = \ln(x^2 y)$$

as (x, y) moves from $(-2, 4)$ to $(-1.98, 3.96)$.

12.7.29 For the function

$$f(x, y) = \sqrt{x^2 + y^2},$$

find the second-order Taylor approximation based at $(x_0, y_0) = (3, 4)$. Then estimate $f(3.1, 3.9)$ using

1. the first-order approximation,
2. the second-order approximation,
3. your calculator directly.

1.2 Section 12.8

12.8.1 For the function

$$f(x, y) = x^2 + 4y^2 - 4x$$

find all critical points. Indicate whether each such point gives a local maximum or a local minimum, or whether it is a saddle point.

12.8.6 For the function

$$f(x, y) = x^3 + y^3 - 6xy$$

find all critical points. Indicate whether each such point gives a local maximum or a local minimum, or whether it is a saddle point.

12.8.15 Express a positive number N as a sum of three positive numbers such that the product of these three numbers is a maximum.

12.8.19 A rectangular metal tank with open top is to hold 256 cubic feet of liquid. What are the dimensions of the tank that require the least material to build.

12.8.24 Find the minimum distance between the point $(1, 2, 0)$ and the quadric cone

$$z^2 = x^2 + y^2$$