

Homework 4 (Due Monday, June 23)

1. Find the equation of the plane tangent to the graph of $z = 4x^2 - y^2 + 2y$ at $(-1, 2)$. Produce a `Matlab` plot showing both the surface and the plane.
2. Find the equation of the plane tangent to the surface

$$\sin(xyz) = x + 2y + 3z$$

at $(2, -1, 0)$.

3. Suppose that $f(1, 2) = 1$, $\frac{\partial f}{\partial x}(1, 2) = 2$, and $\frac{\partial f}{\partial y}(1, 2) = 3$. Use this information to estimate $f(1.1, 1.9)$.
4. Solve the aquarium problem from the Diagnostic Test. A rectangular aquarium is to be designed subject to the following constraints:
 - (a) The aquarium must hold V cubic meters of water.
 - (b) The walls are to be made from glass.
 - (c) The bottom is to be made from slate.

If the price of slate is k times the price of glass (per square meter), what dimensions of the aquarium will minimize the total cost?

Present careful verbal exposition. Validate your solution with a contour plot showing that you found the minimum.

5. Find the local maxima and minima of $f(x, y) = x^3 - 6xy + 8y^3$. Produce a contour plot with extrema marked as circles.