Math 250B X01 Test Two

Time: 50 minutes

Total: 16 marks

Name: _____

1. [3 marks] Ground temperature (in °C) is given by
$f = 21 - 0.4x^2 + 0.3y^2$, where x and y are measured in km.

a) From $(x, y) = (5, 6)$ head towards $(x, y) = (17, 9)$. What is the initial rate of change of temperature?
b) From $(x, y) = (5, 6)$, what is the maximum rate of increase of f?

2. [3 marks] Set up a **triple integral** for the following volume.
Do not evaluate the integral.
The volume bounded by $z = x^2, y + z = 16, y = 0$

3. [5 marks] Solve the following problem using **Lagrange Multipliers**.
Given $2x - y + 2z = 10$, find the values x, y, z that minimize
$f = (x-3)^2 + (y+3)^2 + (z-6)^2$.

4. [5 marks] Use a **double integral in polar coordinates** to calculate the volume between $z = \sqrt{x^2 + y^2}$ and $z = \sqrt{8 - x^2 - y^2}$