

Math 250B X02
Test Two

Time: 50 minutes
Total: 22 marks

Name: _____

1. [4 marks] Set up a **polar double integral** for the following.
Do not evaluate.

The mass of a thin flat plate with density $= y^2$ where the plate's shape is bounded by $4 \leq x^2 + y^2 \leq 9$, $y \geq 0$ and $0 \leq x \leq y$.

2. [6 marks] Ground temperature (in °C) is given by $f = 0.1x^2y - 0.2xy^2$, where x and y are measured in km.

a) From $A = (4, -2)$, a runner heads towards $B = (7, 8)$. What is the runner's initial rate of change of temperature?

b) Starting from $A = (4, -2)$, in which direction does f increase fastest?

c) Starting from $A = (4, -2)$, what is the maximum rate of increase of f ?

3. [6 marks] Evaluate $\int_0^{12} \int_{x/4}^3 x\sqrt{1+y^3} dy dx$.

4. [6 marks] Use the Lagrange Multiplier method to find the point (x, y, z) that minimizes $f = (x - 5)^2 + (y + 8)^2 + (z - 2)^2$, given $2x + 2y - z = 12$.