15.2-3: Recap

Monday, March 28

Optimization

Find the point(s) in the region $\{(x, y) : x^2 \leq y \leq 4\}$...

1. closest to the point $(0, 1)$.
2. closest to the point $(3, 0)$.
3. furthest from the origin.

Order of Integration

Set up a polar double integral in (r, θ) to find the volume of a cone of height h and radius R. If you integrate over r first, what does the remaining 1-dimensional integral represent? What if you integrate over θ first? Make some sketches.

Double Integrals

Sketch each given domain and set up an appropriate double integral $\iint_D f(x, y)$ on the domain. Then find the integral.

1. $D = \{(x, y) : x^2 + y^2 \leq 1, y \leq x\}, f(x, y) = e^{x^2+y^2}$
2. $D = \{(x, y) : x - 5 \leq y \leq 1 - x^2\}, f(x, y) = x - 2y$
3. $D = \{(x, y) : 2y^2 \leq x \leq 1 + y^2\}, f(x, y) = xy - 1$
4. Given a cone of uniform density with radius R and height h, find the smallest r such that at least half of the cone's mass is within distance r of its axis of symmetry.