

By the end of this block of instruction, you should be very comfortable analyzing problems similar to these:

1. A small yard sprinkler distributes water in a circular pattern of radius 15ft. It supplies water to a depth of $e^{-\sqrt{r}}$ feet per hour at a distance of r feet from the sprinkler.
 - (a) What is the total amount of water supplied per hour to the region inside the circle of radius R ft centered at the sprinkler?
 - (b) Determine an expression for the average amount of water per hour per square foot supplied to the region inside the circle of radius R ft.
 - (c) Compute the average amount of water per hour, per square foot, that is supplied to the yard at the sprinklers maximum range.

a) 40.815

b) 0.057

c) 0.057 ft/hr

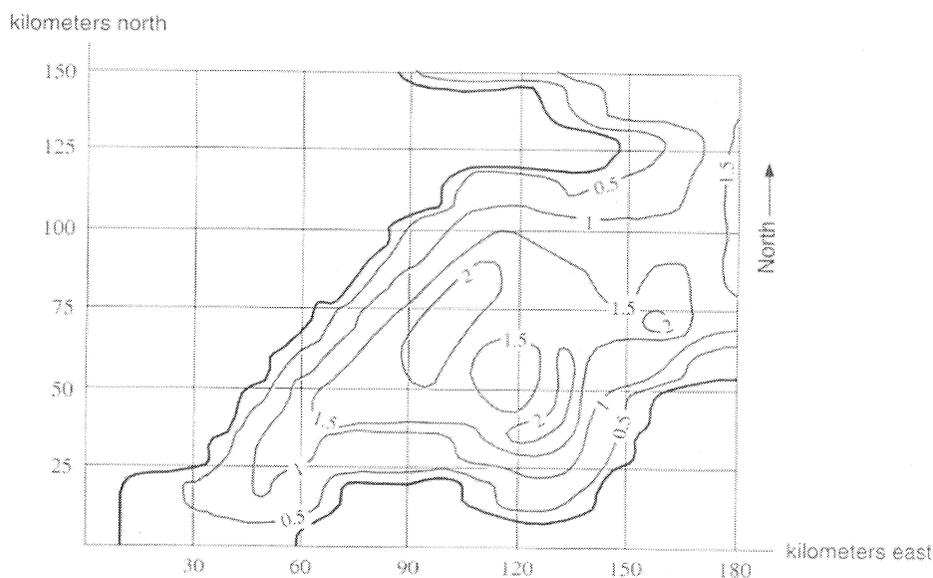
2. A swimming pool is circular with a 40-ft diameter. The depth is constant along east-west lines and increases linearly from 2 ft at the south end to 7 ft at the north end. What is the volume of water in the pool?

5654.86 ft³

3. Electric charge is distributed over a circular disk of radius 2 meters so that the charge density at the point (x, y) is $\sigma(x, y) = x^2 + y^2$ (measured in coulombs per square meter). Find the total charge on the disk.

25.132 COULOMBS

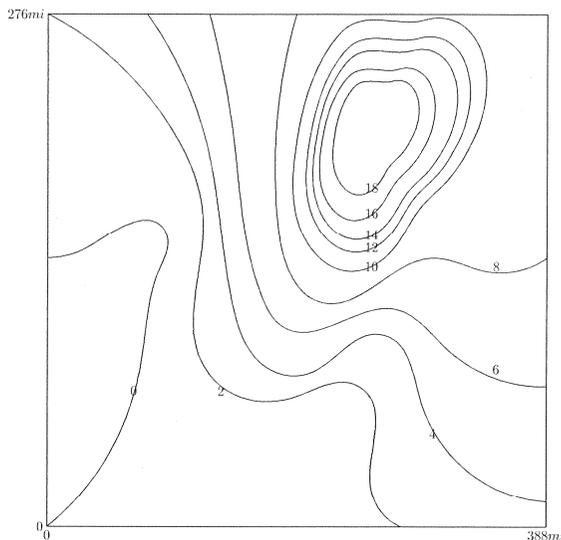
4. Given the contour plot below of the population density of foxes in a region estimate the total fox population in the region. Form upper and lower estimates for the population. What is the average population density for the region?



MIDPOINT \rightarrow Avg = 0.576 Foxes/km²

UPPER LEFT END \rightarrow Avg = 0.518 Foxes/km²

5. The contour map below shows the snowfall in inches that fell on the State of Colorado on a particular day. Determine the average amount of snowfall for the state of Colorado, given this map. Estimate the total amount of snowfall for the state.



5.31 IN

6. A thin disk occupies the region inside the circle $x^2 + y^2 = 2$ but outside the circle $x^2 + y^2 = 1$ in the first quadrant. Find the center of mass if the density at any point is inversely proportional to its distance from the origin.

$$= \frac{1}{K} \left[-\frac{\pi}{4} + 2r \right]$$

7. Determine a single iterated integral that would be equivalent to the sum of iterated integrals also provided below.

$$\int_0^1 \int_0^{y^2} f(x, y) \, dx \, dy + \int_1^2 \int_0^{2-y} f(x, y) \, dx \, dy$$

$$\int_0^1 \int_{y=\sqrt{x}}^{y=2-x} f(x, y) \, dy \, dx$$

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