

Problem Set #7

Due: Wednesday, Mar. 22

1. (a) If $f(x, y)$ gives the pollution density, in micrograms per square meter, and x and y are measured in meters, give the units and practical interpretation of $\int \int_R f(x, y) dA$.
(b) Using Riemann sums with two subdivisions in each direction, find upper and lower bounds for the volume under the graph of $f(x, y) = 2 + xy$ above the rectangle R with $0 \leq x \leq 2$, $0 \leq y \leq 2$.
2. Find the volume of the solid bounded by the surface $z = y\sqrt{y^2 + x}$ and the planes $x = 0$, $x = 1$, $y = 0$, $y = 1$ and $z = 0$.
3. Compute the following iterated integrals.
 - (a) $\int_0^1 \int_0^1 \frac{xy}{\sqrt{x^2+y^2+1}} dy dx$
 - (b) $\int_0^1 \int_0^4 e^y \sqrt{x} + e^y dx dy$
4. Evaluate $\int \int_D \frac{4y}{x^3+4} dA$ where $D = \{(x, y) | 1 \leq x \leq 6, 0 \leq y \leq 4x\}$.
5. Evaluate $\int \int_D x\sqrt{y^2 - x^2} dA$ where $D = \{(x, y) | 0 \leq x \leq y, 0 \leq y \leq 3\}$.
6. Evaluate $\int_0^1 \int_y^1 e^{x^2} dx dy$.
7. Evaluate $\int_0^1 \int_{x^2}^1 x^3 \sin(3y^3) dy dx$.