

Mth 33, Homework 9 on sections 15.5, 15.6

Due by Wed, Apr 15.

Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 3 points.

Section 15.5 Surface Area

Formula. The function $f(x, y)$ has a graph $z = f(x, y)$ that makes a surface. The area of the part S of this surface that lies over a region D in the xy -plane is given by

$$A(S) = \iint_D \sqrt{(f_x)^2 + (f_y)^2 + 1} dA$$

- (1) Use this formula to find the area of the part of the plane $5x + 3y - z + 6 = 0$ that lies above the rectangle $[1, 4] \times [3, 6]$.
 - (2) Find the area of the part of the plane $6x + 4y + 2z = 1$ that lies inside the cylinder $x^2 + y^2 = 25$.
 - (3) Compute the area of the part of the sphere $x^2 + y^2 + z^2 = 9$ that lies above the plane $z = 2$.
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Section 15.6 Triple Integrals

- (4) Let B be the rectangular box $B = [a, b] \times [c, d] \times [r, s]$. In other words,

$$B = \{(x, y, z) \mid a \leq x \leq b, c \leq y \leq d, r \leq z \leq s\}.$$

Use a triple integral to find the volume of this box. Does your answer make sense?

- (5) Find $\iiint_B xy^2z dV$ for $B = [1, 2] \times [0, 2] \times [-1, 2]$.
- (6) Let D be the triangle in the xy -plane with corners at $(0, 0)$, $(\pi, 0)$, $(0, \pi)$. Let E be the region above D and below the plane $z = x + y$. Show that

$$\iiint_E \cos z dV = \pi$$

- (7) Draw the tetrahedron with vertices at the points

$$(0, 0, 0), \quad (2, 0, 0), \quad (0, 2, 0), \quad (0, 0, 2).$$

Its sides are the planes $x = 0$, $y = 0$, $z = 0$ and $x + y + z = 2$. Now use a triple integral to find its volume.

If you are stuck on a question:

- Ask me about it after class.
- Come to my office hours: Mon 4:30 - 5:30, Wed 4:30 - 5:30 in CP 317.
- Go to the Math Tutorial Lab in person in CP 303 or online.