

Math 13 - Winter 2014
Homework 4
Due Wednesday, 5 Feb. 2014.

Note:

- Except for problems that are stated explicitly, all problems are from Stewart Multi-variable Calculus 7th Edition.
- Please show all of your work (writing a list of answers is not sufficient).
- Please indicate the people you worked with.
- Please staple your page together.

1. (3pts) Consider a square fan blade with side length 2 and the lower left corner placed at the origin. If the density of the blade is $\rho(x, y) = 1 + 0.1x$, is it more difficult to rotate the blade about the x -axis or the y -axis?
2. (3pts) Evaluate the iterated integral

$$\int_0^{2\pi} \int_0^{\pi/4} \int_0^{\sec \phi} \rho^3 \sin^2 \phi \, d\rho d\phi d\theta$$

by converting to cylindrical coordinates.

3. (3pts) Evaluate

$$\iint_R (4x + 8y) \, dA,$$

where R is the parallelogram with vertices with $(-1, 3), (1, -3), (3, -1)$, and $(1, 5)$ using $x = \frac{1}{4}(u + v)$, $y = \frac{1}{4}(v - 3u)$.

4. (3pts) Evaluate

$$\iint_R (x + y)e^{x^2 - y^2} \, dA,$$

where R is the region bounded by $x - y = 0$, $x - y = 2$, $x + y = 0$, and $x + y = 3$ by making an appropriate change of variables.

5. (3pts) Find the volume of the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} \leq 1$$

by making the change of variables $x = au$, $y = bv$, and $z = cw$.

6. Let \mathbf{T} be the transformation defined by $x = u$ and $y = v(1 + u^2)$. Let S be the rectangle in the uv -plane given by $0 \leq u \leq 3$ and $0 \leq v \leq 2$.

(a) (1.5pts) Sketch the image R of S under the transformation \mathbf{T} .

(b) (1.5pts) Evaluate

$$\int \int_R \frac{y}{(1 + x^2)^2} dA.$$