

Math 13: Written Homework # 3
Due April 16 at 5pm

Please make sure your homework is stapled, if necessary before handing it in. Do not use paper clips or any variation of folding techniques to connect papers.

Solutions should be justified in a rigorous way. If you are unsure how much work to show, you can ask me prior to turning in your assignment.

- (1) Use spherical coordinates to find the volume of the part of the ball $\rho \leq 4$ that lies between the cones $\phi = \frac{\pi}{6}$ and $\phi = \frac{\pi}{3}$.
- (2) (Problem #14, Chapter 15.10) Let R be the region bounded by the hyperbolas $y = 1/x$ and $y = 4/x$, and the lines $y = x, y = 4x$, in the first quadrant. Find equations for a transformation T that maps a rectangular region S in the uv -plane onto R , where the sides of S are parallel to the u, v axes. In addition, sketch R and S .
- (3) (Problem #18, Chapter 15.10) Evaluate $\iint_R (x^2 - xy + y^2) dA$, where R is the region bounded by the ellipse $x^2 - xy + y^2 = 2$. Use the change of variables $x = \sqrt{2}u - \sqrt{2/3}v, y = \sqrt{2}u + \sqrt{2/3}v$.
- (4) (Problem #24, Chapter 15.10) Evaluate the integral making an appropriate change of variables.

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

, where R is the parallelogram enclosed in the lines $x - y = 0, x - y = 2, x + y = 0$ and $x + y = 3$.

- (5) (Problem #56, Chapter 12.5) Determine if the planes $x + 2y + 2z = 1$ and $2x - y + 2z = 1$ are parallel, perpendicular, or neither. If neither, find the angle between them.