

Math 3298 Practice Midterm 2 problems

The actual exam will consist of three or four required questions and an optional extra credit question.

- (1) Find the average value of the function $1 + 3x + y$ on the triangle with vertices $(0, 0)$, $(1, 0)$, and $(0, 2)$.
- (2) Find the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 9$ and outside the cylinder $x^2 + y^2 = 1$.
- (3) Compute the integral $\int \int \int_R \sqrt{x^2 + y^2} dV$ where R is the region inside the cylinder $x^2 + y^2 = 25$ and between $z = -1$ and $z = 4$.
- (4) Find the volume of the solid bounded by the planes $z = x$, $y = x$, $x + y = 2$, and $z = 0$.
- (5) Change the order of integration of $\int_0^2 \int_{\text{Arctan}(x)}^{\text{Arctan}(\pi x)} dy dx$ and evaluate the integral.
- (6) Compute the integral $\int_{-1}^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{x^2+y^2}^{2-x^2-y^2} (x^2 + y^2)^{3/2} dz dy dx$ by changing to cylindrical coordinates.
- (7) This difficult a problem would be extra credit: Assuming that $\beta \in (0, \pi/2)$ and $a > 0$, compute the following integral

$$\int_0^{a \sin \beta} \int_{y \cot \beta}^{\sqrt{a^2 - y^2}} \int_0^1 \ln(x^2 + y^2) dz dx dy$$