

Review Midterm

Sections from the textbook to be studied for the midterm are: 5.1, 5.2, 5.3, 5.4, 5.5, 6.1, 6.2, 6.3, 6.4, 7.1 and 7.2. Review also your class notes.

1. Review the graph of quadratic surfaces (see Stewart for example.)
2. Evaluate $\iiint_{\mathcal{E}} xz \, dx \, dy \, dz$ where \mathcal{E} is bounded by the planes $z = 0$, $z = y$ and the cylinder $x^2 + y^2 = 1$ in the half space $y \geq 0$.
3. Let $\vec{F}(x, y, z) = (z^3 + 2xy, x^2, 3xz^2)$ be a vector field in \mathbb{R}^3 . Compute the line integral $\int_{\Gamma} \vec{F} \cdot d\vec{s}$, where Γ is the triangle whose vertices are $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$, oriented in the counterclockwise direction.
4. Understand the statements of Fubini's theorem, iterated integration and the change of variables formulas for double and triple integrals.
5. Let \mathcal{D} be the region bounded by the $x = 1$, $y = 0$ and $yx = 1$. Compute $\iint_{\mathcal{D}} xy e^{-(x^2+y^2)} \, dx \, dy$. (See lecture notes or section §6.4, exercise 6.)
6. Find the volume of the solid that lies above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = z$.
7. Evaluate $\iint_{\mathcal{R}} e^{\frac{x+y}{x-y}} \, dx \, dy$, where \mathcal{R} is the trapezoidal region with vertices $(1, 0)$, $(2, 0)$, $(0, -2)$ and $(0, -1)$.
8. Let \mathcal{R} be a rectangle with vertices $(0, 0)$, $(2, 3)$, $(5, 1)$ and $(3, -2)$. Use the transformation

$$\begin{aligned} x &= 2u + 3v \\ y &= 3u - 2v \end{aligned},$$

to evaluate $\iint_{\mathcal{R}} (x + y) \, dx \, dy$.