

MATH 32B: MIDTERM 1 REVIEW PROBLEMS

Problem 1. Find the average value of $2x + y^2$ over the triangle bounded by the lines $y = x$, $y = 2 - x$, and $y = 0$.

Problem 2. Evaluate $\int_0^1 \int_0^1 xy e^{x^2 y} dy dx$.

Problem 3. Find the volume of the solid cut off by the plane $x + y + z = 1$ in the first octant.

Problem 4. Find the volume of the solid between the cone $z = \sqrt{x^2 + y^2}$ and the sphere $x^2 + y^2 + z^2 = 1$.

Problem 5. Find the center of mass of a lamina in the first quadrant bounded by the curve $y = 1 - x^2$ with density function $\rho(x, y) = 2 + x$.

Problem 6. Find the volume of the figure bounded above by the surface $z = 2 + \sqrt{x^2 + y^2}$ above the region in the plane inside of the circle with radius 2 and center at $(0, 2)$.

Problem 7. Evaluate $\int_0^1 \int_x^{2x} \int_0^2 2xyz dz dy dx$.

Problem 8. Write the equation $x^2 + y^2 = 2y$ in cylindrical coordinates.

Problem 9. Evaluate $\iiint_H (9 - x^2 - y^2) dV$, where H is the upper hemisphere of radius 3 centered at the origin.

Problem 10. Show that $\lim_{a \rightarrow \infty} \iiint_{S_a} \sqrt{x^2 + y^2 + z^2} e^{-(x^2 + y^2 + z^2)} dV = 2\pi$, where S_a is the sphere centered at the origin with radius a .