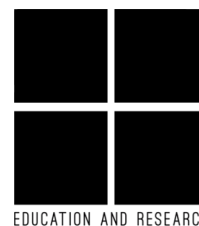


UP SCHOOL OF STATISTICS STUDENT COUNCIL

Education and Research

erho.weebly.com | erhomyhero@gmail.com | f/erhoismyhero | @erhomyhero



Mathematics 55 Second Long Exam

M55_LE2_005
Elementary Analysis III
2nd Semester AY 2013-2014

Show all necessary solutions. Write legibly and box every final answer. Use black or blue pen only.

- 1) Use rectangular coordinates to evaluate the triple integral $\iiint_G y \, dV$, where G is the solid bounded by $2x + 3y + 2z = 6$ and the coordinate planes. (5 points)
- 2) Use cylindrical coordinates to find the volume of the solid in the first octant bounded by the planes $y = 2z$, $x = 0$, $z = 0$ and the cylinder $x^2 + y^2 = 4$. (5 points)
- 3) Use spherical coordinates to set up the iterated integral equal to the mass of the solid bounded above by the sphere $x^2 + y^2 + (z - 2)^2 = 4$ and bounded below by the cone $z = \sqrt{x^2 + y^2}$ if the density at any point (x, y, z) on the solid is $x + 1$. (5 points)
- 4) Let $\vec{F}(x, y, z) = 2ye^{2x} \vec{i} + e^{2x} \vec{j} + 3z^2 \vec{k}$. Show that \vec{F} is conservative and use a potential function for \vec{F} to find the value of the line integral $\int_C \vec{F} \cdot d\vec{R}$, where C is any sectionally smooth curve from the point $(\ln 2, 1, 1)$ to the point $(\ln 2, 2, 2)$. (5 points)
- 5) Evaluate the integral $\int_C (x^2 + xy) \, dx + (y^2 - xy) \, dy$, where C consists of the line segment $y = x$ from the point $(0, 0)$ to the point $(2, 2)$ and the vertical line from $(2, 2)$ to $(2, 0)$. (5 points)
- 6) Use Green's Theorem to evaluate the line integral $\oint_C y^2 \, dx + x^2 \, dy$, where C is the closed curve determined by the x -axis, the line $x = 1$, and the curve $y = x^2$ traversed in counter clockwise direction. (5 points)
- 7) Let the surface S be given by $\vec{r}(u, v) = u \cos v \vec{i} + u \sin v \vec{j} + (v + 3) \vec{k}$
 - (a) Find $\vec{r}_u \times \vec{r}_v$ (2 points)
 - (b) Evaluate the surface integral $\iint_S \sqrt{x^2 + y^2} \, d\sigma$. (3 points)
- 8) Let $\vec{F}(x, y, z) = -x \vec{i} + (y + 2) \vec{j} + z \vec{k}$ be the velocity field of a fluid and let S be the portion of the plane $3x + 2y + z = 6$ in the first octant. Find the flux of \vec{F} across S . (5 points)

Total: 40 points

Any form of cheating in examinations or any act of dishonesty in relation to studies shall be subject to disciplinary action.