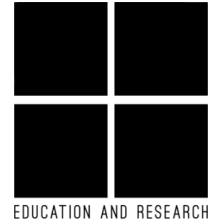




# UP SCHOOL OF STATISTICS STUDENT COUNCIL

*Education and Research*

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EDUCATION AND RESEARCH

## Mathematics 55 Second Long Exam

M55\_LE2\_001  
Elementary Analysis III  
2nd Semester AY 2014-2015

- Let  $G$  be a solid in the first octant bounded below by the cone  $z = \sqrt{\frac{x^2 + y^2}{3}}$  and above the plane  $z = 3$ . Suppose that the density at a point  $(x, y, z)$  in  $G$  is  $f(x, y, z) = 2z$ .
  - Set up an iterated triple integral that gives the mass of  $G$  using rectangular coordinates and spherical coordinates.
  - Find the mass of  $G$  using spherical coordinates.
- Let  $\vec{F}(x, y, z) = \langle zye^{x^2}, xze^{y^2}, xye^{z^2} \rangle$ . Find the divergence of  $\vec{F}$  and curl of  $\vec{F}$ .
- Let  $\vec{F}(x, y, z) = \langle 2x \cos y, e^z - x^2 \sin y, ye^z \rangle$ .
  - Show that  $\vec{F}$  is conservative by finding a potential function for  $\vec{F}$ .
  - Find the work done by  $\vec{F}$  on a particle that moves on any smooth curve from the point  $(0, 1, 0)$  to the point  $(2, 0, 3)$ .
- Evaluate  $\int_C (xy + y^2) ds$  where  $C$  is the lower half of the circle  $x^2 + y^2 = 9$ , described in the counterclockwise direction.
- Evaluate  $\int_C y dx + z dy - x dz$  where  $C$  is the line segment from  $(0, 1, 2)$  to  $(1, 3, 6)$  followed by the line segment from  $(1, 3, 6)$  to  $(1, 3, 2)$ .
- Let  $\vec{F}(x, y) = \langle 2xy, xy + x^2 \rangle$ . Using Green's Theorem, evaluate  $\int_C \vec{F} \cdot d\vec{R}$ , where  $C$  is the triangular path traced in the counterclockwise direction with vertices at the points  $(0, 0)$ ,  $(1, 0)$  and  $(2, 1)$ .
- Find the flux of  $\vec{F}(x, y, z) = \langle x, y, z \rangle$  across the part of the positively-oriented paraboloid  $z = 1 - 4x^2 - 4y^2$  above the  $xy$ -plane.

END OF EXAM