Third Examination
Tuesday, October 30, 2018

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each part of problem is worth 16 points, and 4 points are free.

1. Evaluate the following double integrals. *Hint: for one or both of these, it may be easiest if you change the order of integration.*

$$(a) \int_0^1 \int_0^1 \frac{y}{(xy+1)^2} dy dx \quad (b) \int_1^2 \int_0^{y^2} e^{x/y^2} dx dy$$

2. Consider $I = \iint_{\mathcal{R}} (x+y) dA$, where $\mathcal{R}$ is the region in the first quadrant above the curve $y = x^2$ and below the curve $y = \sqrt{x}$.

   (a) Draw the region $\mathcal{R}$.

   (b) Evaluate I.

3. Find an equation for the tangent plane at the point $(1, 2, -1)$ (corresponding to $u = 1$, $v = 1$)to the surface given by

$$\mathbf{r}(u, v) = \langle u, u+v, u^2 - 2v^2 \rangle.$$

4. Using the appropriate coordinate system, compute

$$\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{-\sqrt{4-x^2-y^2}}^{\sqrt{4-x^2-y^2}} \sqrt{x^2+y^2+z^2} dz dy dx.$$