

**Seventh Examination**  
*Tuesday, November 25, 2014*

**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 entire problem is worth 33 points, and 1 point is free.

In each of these problems, compute  $\int \int_{\mathcal{S}} \vec{F}(\vec{r}) \cdot d\vec{A}$ .

1.  $\vec{F}(\vec{r}) = (1, 2, 3)$ , and  $\mathcal{S}$  is the surface  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ ,  $z = 1/3$ , oriented in the direction of the positive  $z$ -axis.
2.  $\vec{F}(\vec{r}) = \frac{1}{\sqrt{x^2 + y^2 + z^2}}(x, y, z)$ , and  $\mathcal{S}$  is the sphere of radius 1 centered at the origin, oriented outward.
3.  $\vec{F}(\vec{r}) = (x \sin(y^2) + x)\vec{i} + e^{x^2+z^2}\vec{j} - z \sin(y^2)\vec{k}$ , and  $\mathcal{S}$  is the surface of the cube  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ ,  $0 \leq z \leq 1$ , oriented outward.