**Math 241 X8** **Name:**

**Quiz # 8**

November 21, 2013 No electronic devices or interpersonal communication allowed. Show work to get credit.

(1) A surface $R$ is given in spherical coordinates as

$$\rho = 4 + \sin(2\varphi)(e^{-\sin\theta}\cos\theta) + \cos(7\varphi)$$

(or $r = 4 + \text{Sin}[2s](E^{-\text{Sin}[t]}\,\text{Cos}[t]) + \text{Cos}[7s])$), with $\varphi = s \in [0, \pi/2]$ and $\theta = t \in [0, 2\pi]$. Below are two pictures of $R$. Find the net flow of $\mathbf{F}(x, y, z) = \langle xz + e^y, -yz - \sin z, 1\rangle$ across $R$.

Big Hint: don't do this directly, but you do need that equation for something.