1. Let $S$ be the portion of the plane $x + y + z = 1$ which lies in the positive octant.

   (a) Draw a picture of $S$.

   (b) Find a parameterization $\mathbf{r}: D \rightarrow S$, being sure to clearly indicate the domain $D$. Check your answer with the instructor.

   (c) Use your answer in (b) to compute the area of $S$ via an integral over $D$.

   (d) Check your answer in (c) using only things you learned in the first few weeks of this class.

2. Consider the surface $S$ which is the part of $z + x^2 + y^2 = 1$ where $z \geq 0$.

   (a) Draw a picture of $S$.

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3. Let $S$ be the surface given by the following parameterization. Let $D = [-1, 1] \times [0, 2\pi]$ and define

   $\mathbf{r}(u, v) = (u \cos v, u \sin v, v)$.

   (a) Consider the vertical line segment $L = \{u = 0\}$ in $D$. Describe geometrically the image of $L$ under $\mathbf{r}$.

   (b) Repeat for the vertical segments where $u = -1$ and $u = 1$.

   (c) Use your answers in (a) and (b) to make a sketch of $S$.

4. Consider the ellipsoid $E$ given by $\frac{x^2}{9} + \frac{y^2}{4} + z^2 = 1$.

   (a) Draw a picture of $E$.

   (b) Find a parameterization of $E$. Hint: Find a transformation $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ which takes the unit sphere $S$ to $E$, and combine that with our existing parameterization of the plain sphere $S$. 

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**Thursday, November 1  Surface Parameterpalooza**

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