Problems: Flux Through General Surfaces

1. Let $\mathbf{F} = -y\mathbf{i} + x\mathbf{k}$ and let S be the graph of $z = x^2 + y^2$ above the unit square in the xy-plane. Find the *upward flux* of $\mathbf{F}$ through S.

2. Let $\mathbf{F} = -y\mathbf{i} + x\mathbf{k}$ and let S be the graph of $z = x^2 + y$ above the square with vertices at $(0,0,0)$, $(2,0,0)$, $(2,2,0)$ and $(0,2,0)$. Find the upward flux of $\mathbf{F}$ through S.

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