1. Let $D$ be the region in the plane bounded by $x \geq 0$, $y \geq 0$, and the ellipse $4x^2 + y^2 = 4$ and let $R$ be the solid lying above $D$ and below the graph of the function $f(x,y) = x + 2y$.

(a) Set up, but do not evaluate, the two double integrals in rectangular coordinates that calculate the volume of $R$. (3 points)

\[
\int_0^\infty \int_0^{\frac{\sqrt{4-x^2}}{2}} \left( x + 2y \right) \, dy \, dx
\]

(b) Set up, but do not evaluate, an integral in polar coordinates that calculates the volume of $R$. (2 points)

\[
\int_0^\infty \int_0^{\pi/2} r \left( r \cos \theta + 2r \sin \theta \right) \, dr \, d\theta
\]

2. Let $D$ be the region in the plane bounded below by the $x$-axis and above by the circle $x^2 + y^2 = 1$. Convert the double integral $\iint_D x + 2 \, dA$ into polar coordinates and evaluate the double integral. (3 points)

\[
\int_0^{\pi} \int_0^1 r \left( r \cos \theta + 2r \sin \theta \right) \, dr \, d\theta
\]
3. Rewrite the given triple integral in the two other specified orders:

\[ \int_0^1 \int_{\sqrt{x}}^{1} \int_0^{1-y} f(x, y, z) \, dz \, dy \, dx. \]

(2 points)