1. Express the integral \( \iiint_E f(x, y, z) \, dV \), where \( E \) is the solid bounded by \( y = 2x^2 + 2z^2 \) and the plane \( y = 8 \);

**Solution:** The region \( D \) in the \( xz \)-plane can be found by standing in front of this solid and we can see that \( D \) will be a disk in the \( xz \)-plane. This disk will come from the front of the solid and we can determine the equation of the disk by setting the elliptic paraboloid and the plane equal.

\[
2x^2 + 2z^2 = 8 \rightarrow x^2 + z^2 = 4
\]

This region, as well as the integrand, both seems to suggest that we should use something like polar coordinates. However we are in the \( xz \)-plane and weve only seen polar coordinates in the \( xy \)-plane. This is not a problem. We can always translate them over to the \( xz \)-plane with the following definition.

\[
x = r\cos\theta \\
z = r\sin\theta
\]

Since the region doesnt have \( y \)s we will let \( z \) take the place of \( y \) in all the formulas. Note that these definitions also lead to the formula,

\[
x^2 + z^2 = r^2
\]

With this in hand we can arrive at the limits of the variables that well need for this integral

\[
2x^2 + 2z^2 \leq y \leq 8 \\
0 \leq r \leq 2 \\
0 \leq \theta \leq 2\pi
\]