#1. (12) Sketch the region of integration and evaluate the integral. \[ \int_{x=1}^{x=2} \int_{y=0}^{y=2x+1} xy \, dy \, dx \]

#2. (12) Find the \( \overline{y} \) component of the centroid of the region R between the x-axis and the arch \( y = \cos x \) with \( -\frac{\pi}{2} \leq x \leq \frac{\pi}{2} \). (There is no need to find \( \overline{x} \), because by symmetry I know that \( \overline{x} = 0 \).)

#3. (13) Change the Cartesian integral into an equivalent polar integral and then evaluate. \[ \int_{y=0}^{y=2} \int_{x=0}^{x=\sqrt{4-y^2}} \left( x^2 + y^2 \right) \, dx \, dy \]

#4. (13) Evaluate \[ \int_{x=0}^{x=1} \int_{y=0}^{y=2-x} \int_{z=0}^{z=2-x-y} dz \, dy \, dx \]

**BONUS:** (10) Find the mass of the solid in 3-space in the first octant and bounded by the planes \( x = 6 \) and \( y + z = 4 \) if the density is \( \delta(x, y, z) = \frac{kg}{m^3} \). (You must use triple integrals to get this credit.) (Extra-extra credit for a really nice sketch.)