Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Sketch the domain $\mathcal{D} = \{(x,y) : 0 \leq x \leq 2, 0 \leq y \leq 2x - x^2\}$ and then calculate the integral
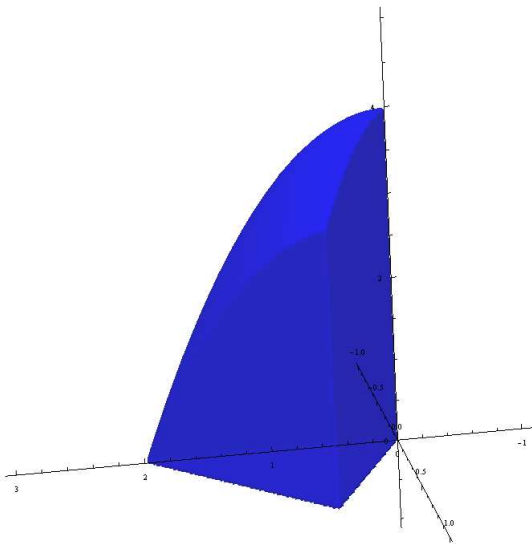
$$\iint_{\mathcal{D}} y\sqrt{x}\, dA.$$

2. Compute the iterated integral $\displaystyle\int_0^1 \int_0^y \frac{\sin x}{1-x}\,dx\,dy$.

3. Evaluate $\iint_{\mathcal{D}} x \, dA$, where $\mathcal{D}$ is the region in the first quadrant between the two circles of radius 1 pictured below.
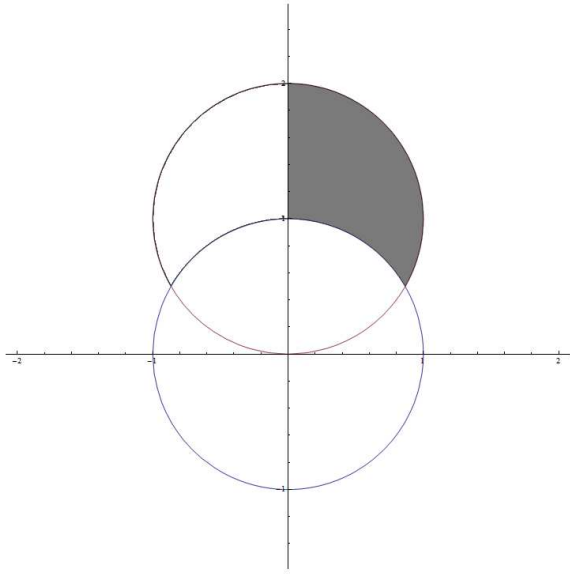
4. Let $\mathcal{W}$ be the region bounded by $x = y$, $x + 2y = 2$, $y = 0$, $z = 0$ and $z = 4 - x^2 - y^2$. Express this region formally in rectangular coordinates and then use a triple integral to find its volume.

5. Compute the volume of the solid $\mathcal{S}$ defined by

$$\mathcal{S} = \{(x, y, z) : 4 - x^2 - y^2 \le z \le 10 - 4x^2 - 4y^2\}.$$