1. In modern terms, the methods of exhaustion we discussed in class can be used to prove that there exists a constant $\pi$ such that the area of a circle of radius $r$ is $\pi r^2$. Show in a similar fashion that there exists a constant $\tilde{\pi}$ such that the circumference of a circle of radius $r$ is $\tilde{\pi} r$. (5 pts)

2. Use the method of section (or scissor’s congruence) to argue that the area of a regular $n$-gon (for a fixed integer $n > 2$) is proportional to the square of the length of its sides. (You may use the fundamental assumption that the area of a rectangle is the product of the lengths of its base and its height.) (5 pts)

3. Use the method of exhaustion to give an argument that the ratio of the area of two similar ellipses is equal to the square of the ratio of their circumference. (5 pts)

4. Look up a formula for the area of regular polygons. Can you use it to approximate the constant $\pi$ of problem 1 to three digits? (5 pts)