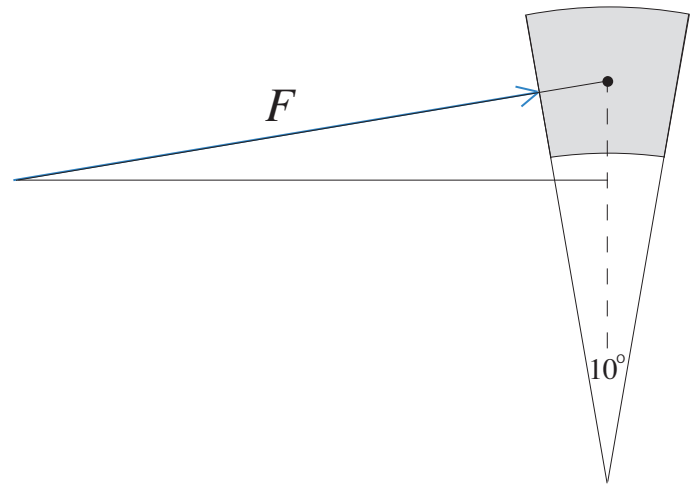


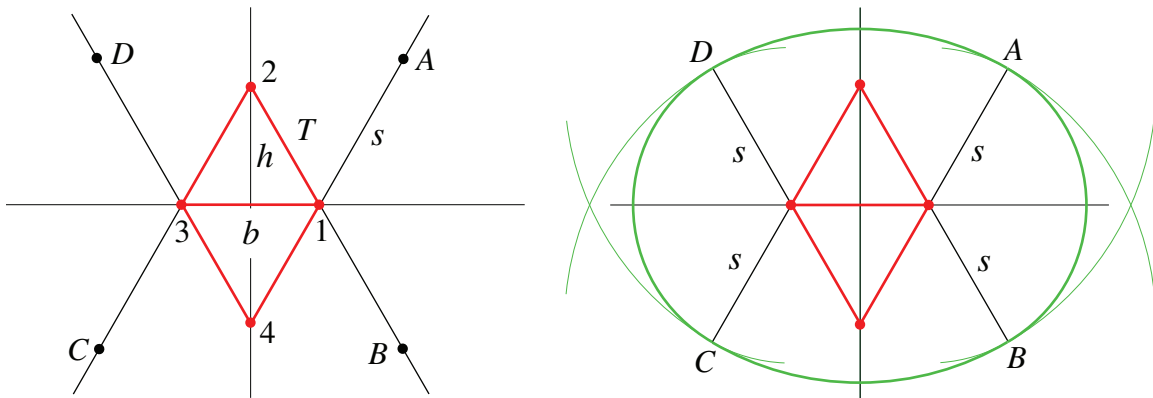
Practice Mid-Term Math 10270. February 25, 09. Name

Please Note: For full credit your arguments need to be complete and precise. They also need to be presented in a well organized and lucid way. Suggestion: First collect your thoughts on the scrap paper provided.

1. (15 pts) The figure below depicts a keystone of a stable semicircular Roman arch. The keystone weighs 700 pounds. Compute the magnitude of the force F needed to keep it in place. (It is understood that a force of the same magnitude also acts on the other side of the keystone. Friction is ignored.)



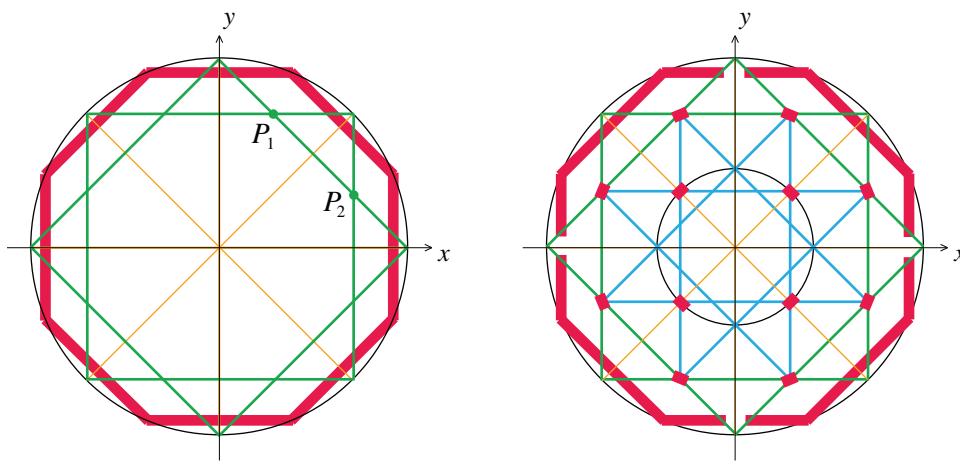
2. (15 pts) Let the triangle in the construction of ovals have base b and height h . Find expressions for the short and long axes of the oval in terms of b , h , and s .



3. (15 pts) Describe the essential structural components of a Gothic cathedral from the vault downward and explain how one component depends on the next.

4. (15 pts) What makes Ptolemy's world map mathematically significant? Why is this significant?

5. (15 pts) Consider the plan of the Dome of the Rock (as shown below). Let the surrounding circle have radius R . Place an x - y coordinate system into each figure in such a way that the horizontal and vertical segments lie on the x - and y -axes respectively and their point of intersection is the origin. Notice that each of the points 1 and 2 is the intersection of a pair of lines. Find the equations



of each pair of lines. Then find the coordinates of the points 1 and 2. Use these coordinates to determine the radius of the smaller circle on the right.

6. (15 pts) Sketch the graph of the equation $9x^2 - 36x + 25y^2 - 200y + 211 = 0$. [Hint: Complete squares.]

