Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Georgia Southern decides to build a new **400 meter track** that contains 2 straight sections and 2 semicircular ends. In order to play soccer on the enclosed field, they want to maximize the area of the perfect rectangular region that separates the semicircular ends. [Circumference of a circle is C = 2 r]

1. Draw the region and label the drawing using x for the straight sections and r for radius. Also shade the perfect rectangle referred to in the directions.
2. What kind of units will be used for the phrase “**400 meter track**”? m, m2, m3
3. Write the secondary equation that describes **400 meter track** and solve for x.
4. In the statement of the problem above question 1, underline the optimization word and the next 2 words in the problem.
5. What letter should we use for the third word underlined?
6. State the units for that word.
7. Write the primary equation.
8. Replace the x in the primary equation with your answer to 3.
9. Differentiate the primary with respect to r and set the derivative equal to zero.
10. Solve for r and then
11. Solve for x. ( see no 3.).
12. Prove that your answer is a local maximum. [first or second derivative test]
13. What would the primary equation be if the problem said “maximize the total area enclosed by the track”?

TA =

1. Substitute x ( see no 3.) into the new primary.
2. Differentiate TA with respect to r and set the derivative equal to zero.
3. Solve for r and find x ( see no 3.).
4. What is the shape of this track?