Name:_____
M243: Calculus II (Fall 2018)
Midterm Exam, part II

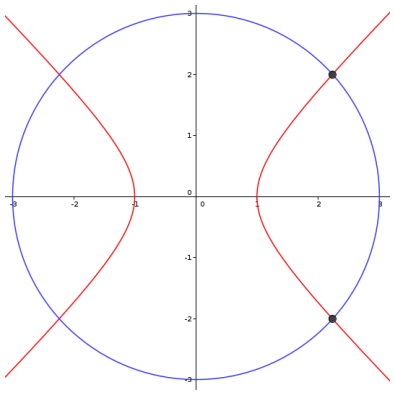
WICHITA STATE UNIVERSITY

Read and follow all instructions. You may not use any electronic devices, but you may use one 3×5 in^2 index card of your own hand-written notes.

Part I: Applications

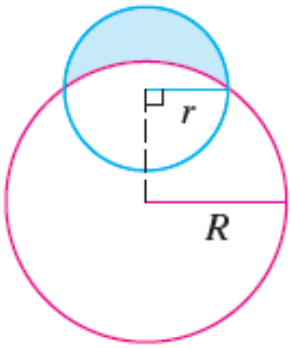
In each of the following problems, set up and simplify an integral that represents the desired quantity. Do **NOT** *evaluate the integrals.*

1. Write an integral that represents the portion of the arc length of the hyperbola $x^2 - y^2 = 1$, $x > 0$, that is cut off by the circle $x^2 + y^2 = 9$.



2. Write an integral that represents the surface area of a torus with major radius $R = 2$ and minor radius $r = 1$.
[Recall: such a torus is obtained by rotating the circle $(x-R)^2+y^2 = r^2$ about the y-axis.]

3. Write an integral that represents that area of the lune in the figure.



Part II: Proofs

Prove the formulas, showing enough work to justify each step.

4. $\dfrac{d}{dx}\left[\arctan(x)\right] = \dfrac{1}{1+x^2}$

5. $\cosh^{-1}(x) = \ln\left(x + \sqrt{x^2-1}\right)$