

## Written Homework 7

Math 126

Solve each of the following problems. Write your solutions clearly and neatly on separate paper, explaining your reasoning with complete sentences. Submit your work either in class or in the homework mailbox (RMS level 3, near the fireplace) by 4:00pm on **Wednesday, October 9**.

1. Recall that the graph of  $x^2 + y^2 = r^2$  is a circle of radius  $r$ .
  - (a) Write an integral that represents the circumference of a circle of radius  $r$ .
  - (b) Is your integral an improper integral? Explain why or why not.
  - (c) Evaluate the integral and show that you get the formula you know from geometry.

*Hint:* If working with  $r$  is confusing, choose your favorite value for  $r$  and solve the problem using that  $r$ . Then consider how the solution would change if you change the value of  $r$ . Your final solution should depend on  $r$ .

*Another hint:*  $\int \frac{1}{\sqrt{a-x^2}} dx = \arctan\left(\frac{x}{\sqrt{a-x^2}}\right) + C$

2. Give an example of a sequence that converges to 3. Use a formula or words (or both!) to describe the  $n$ th term of your sequence.
3. Give an example of a sequence that diverges, and that has infinitely many positive terms and infinitely many negative terms. Use a formula or words (or both!) to describe the  $n$ th term of your sequence.
4. Give an example of a strictly decreasing (that is, monotonically decreasing) sequence that converges to 100. Use a formula or words (or both!) to describe the  $n$ th term of your sequence.