

# Exercise Week 12

COMP 150

Spring 2021

# Your name here

- (1.) Define the functions  $f(x) = \tan\left(\frac{\pi x^2}{4}\right)$  and  $g(x) = \pi x + 1 - \pi$  in Sage for use throughout this exercise.
- (2.) Plot both functions on the same set of axes. Choose a scaling that lets you see the key features of each graph.
- (3.) Find an  $x$ -value where the two graphs intersect. You may identify this value visually. Make sure you also establish mathematically that you have found an  $x$ -value where the graphs intersect.
- (4.) Find the corresponding  $y$ -value where the intersect. You may identify this value visually. Make sure you also establish mathematically that you have found a point  $(x, y)$  where the graphs intersect.
- (5.) One of the graphs is a line. What is its slope? In Sage, we can calculate the derivative of  $f(x)$  using the following command: `derivative(f(x), x)`. Use Sage to find the derivative of  $f(x)$ . Use Sage to find the value of the derivative of  $f(x)$  at  $x = 1$ . Explain how this value compares with the slope of the line you identified in this question. From a calculus point of view, what is the significance of how  $f'(1)$  compares to the slope? Refer to your graph in your answer.