

Ursinus MATH 111 Quiz 7 (Take Home)

You must work on this quiz individually, but you can take more time than usual; this quiz will be due at the beginning of class on Monday 11/11. You may look at your notes, and you may use Maple or Sage to help check your answers, but you must show work to receive full credit. Furthermore, please write and sign the following statement, and attach it with your submission: *I pledge my honor that I have followed the above restrictions while completing this assignment.*

1. (15 Points) Let

$$f(x) = e^{-x^2+4x-4}$$

Sketch a plot of $f(x)$, including any vertical asymptotes, horizontal asymptotes, and holes, if they exist. Please also indicate critical points with a dot and inflection points with an x on your graph. Finally, please indicate which intervals are concave up, and which intervals are concave down. *Extra Credit (+2pts): What shape is this this curve?*

2. (15 Points) Dr. Scoville is sitting on the beach at the water's edge enjoying a moral philosophy tome, when suddenly Dr. Tralie begins to drown 60 meters out into the water in front of the part of the beach 100 meters to the left of Dr. Scoville. In maximizing his utility in this situation, Dr. Scoville wants to reach Dr. Tralie as quickly as possible. Dr. Scoville can run at 6 meters/second, but he can only swim at 2 meters/second. Assuming he runs straight at the water's edge parallel to the water and then swims in a straight line through the water to Dr. Tralie, *how far to the right of Dr. Tralie should he jump into the water if he wants to minimize the amount of time it takes to reach his position?* Draw a picture that shows the path Dr. Scoville will have to take, and use this picture to setup time as a function of x , the distance to the right of Dr. Tralie along the beach where Dr. Scoville first jumps into the water. Use the second derivative test to show your chosen x is indeed a minimum of the function, and check the endpoints of your function to make sure it is an absolute minimum. *Does it matter how far to the right of Dr. Tralie that Dr. Scoville is when he first starts running? Demonstrate mathematically why or why not. Does this surprise you?*