Instructions: You may work alone or in teams, but each person must turn in his or her own paper. Your write up must be in your own words. Staple the cover sheet to the front of your assignment. Write on only one side of the page, type when possible.

#1 Suppose your car holds 15 gallons of gas and the tank is full. Your car also gets 20 miles to a gallon of gasoline. You are going to study the amount of gas left in your car’s tank after driving for some number of miles.

a. Define the independent and dependent variables. What is the domain?

b. Develop an expression for the dependent variable in terms of the independent variable. Use that expression to determine how much gas will be left in your tank after you have driven 127 miles and how many miles you can drive before running out of gas.

c. Graph the function you developed.

d. What are the slope and the y-intercept of your graph and what is their physical significance in the context of this problem?

e. In a sentence or two, describe the limitations of this model. What would need to be done to refine this model to make it more realistic?

#2 In this problem, you are going to study how water is wasted in the brushing of teeth. Let \( n \) be the number of people that let the water run while brushing their teeth. Let \( w(n) \) be the amount of water that is wasted per day by these people while brushing their teeth.

a. Estimate how much water is wasted when you leave the water running while brushing your teeth. Assuming you brush your teeth 3 times per day, estimate how much water would be wasted per day if you leave the water running while brushing your teeth.

b. Assuming that everyone wastes about the same amount of water as you, develop an expression for \( w(n) \) in terms of \( n \). Use this expression to estimate the amount of water wasted by the students at the College of the Holy Cross if everyone left the water running.

c. In part (a), you estimated the amount of water wasted brushing your teeth. This value may vary from person to person. Make what you think is an underestimate for the amount of water wasted each day, and rework part (b) using this underestimate.

d. Make what you think is an overestimate for the amount of water wasted brushing your teeth, and rework part (b) using this overestimate.

e. In a sentence or two, describe the limitations of this model. What would need to be done to refine this model to make it more accurate?