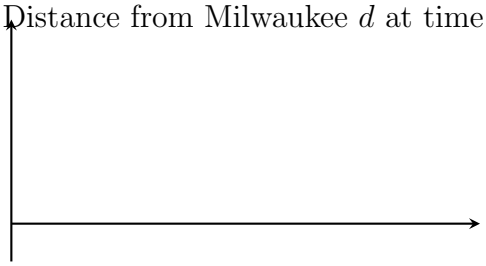
MATH 1450 **Name:**_____

Activity 1

In class we learned about several different types of functions (linear, exponential, etc.). This activity is intended to encourage you to think more deeply about and relate them to real world situations. Although you'll be working in groups, each person needs to turn in their own completed copy of the activity.

1. Your best friend just got you courtside seats to the next Bucks-Pistons game, but the game is in Detroit. As you drive from Milwaukee to Detroit (383 miles), you pass through Chicago, which is 92 miles from Milwaukee. Assume that you travel at a constant speed. Sketch graphs which represent the functions described below. Label your axes and any important features of your graphs.

Distance from Milwaukee d at time t



Distance from Chicago y at time t

Distance from Detroit x at time t

Time t at distance x from Detroit

2. The relationship between the tuition a student pays, T (measured in dollars), and the number of credits a student takes, c, at Wossamotta University can be described as:

$$T(c) = \begin{cases} 500{+}425c & 0 \leq c \leq 8 \\ 1000{+}350(c-2) & 8 < c \leq 21 \end{cases}$$

(a) What is the tuition cost for a student taking 3 credits?

(b) If the tuition was \$4,150, how many credits did the student take?

(c) What is the domain of the function T? What does this mean for students at Wossamotta U?

(d) What are the practical interpretations of the y-intercept and slope of the graph of T?

3. The US population has steadily moved westward over the years. To observe this, we look at the "population center" of the US, which is the point at which the country would balance if it were a flat plate with no weight, and every person had equal weight. In 1790 the population center was east of Baltimore, Maryland. It has been moving westward ever since, and in 2020 it was estimated to be in Hartville, Missouri. During the second half of the 20th century, the population center moved about 40 miles west every 10 years.

(a) Assume position is measured westward from Hartville along the line running through Baltimore. For the years since 2020, express the approximate position of the population center as a function of time in years after 2020.

(b) The distance from Baltimore to Hartville is a bit over 1000 miles. Could the population center have been moving at the same rate for the last two centuries?

(c) Could the function in part (a) continue to apply for the next five centuries? Why or why not? [Hint: You may want to look at a map. Note that the distances are in air miles and not driving distances.]

4. You and a friend plan to purchase cars in September. The initial value of your car will be \$45,000 and will depreciate 17% each year. The initial value of your friend's car will be \$23,500 and will depreciate 10.5% each year. You agree to exchange cars when their values are equal.

(a) How long do you need to wait (to the nearest month)? What will be the value of your car at that time?

(b) What would the depreciation rate of your car have to be for the values of the cars to match at the end of 7 years? (Assume your friend's car still depreciates 10.5% each year.)