Some guidelines for Team Homework

- You must *read* and *attempt* the problems *before* meeting with your team. Even if you aren’t able to obtain all the answers, being prepared during the team meetings helps your group work more efficiently during the meeting.

- Don’t be discouraged if you cannot solve most of the problems on your own — this is perfectly normal. This is part of why you are being assigned to work on these assignments as a group; make sure to discuss your questions and ideas with your teammates.

- If your team is having trouble with a particular problem, try visiting the Math Lab ([https://umich.instructure.com/courses/427942](https://umich.instructure.com/courses/427942)) with your teammates to get help.

- Make sure *everyone* is involved and no-one feels excluded during the meetings. If you have a tendency to speak a lot, make sure to make room for others to contribute as well. If you notice someone is being quiet, actively encourage them to contribute to the group.

- Ask your teammates to explain their reasoning behind their answers if you don’t understand it. Remember that all members of the team are responsible for this assignment, and *everyone* should be on board with what the team turns in.

- Write up your final solutions neatly, and make sure your explanations are clear and complete. Make sure you go over the [Team Homework Tutorial](https://instruct.math.lsa.umich.edu/support/teamhomework/) on the course website:
1. This is the same problem as the one you handed in this week. Read over the feedback you receive from your instructor, and use it to revise your solution.

You’re doing a study of how crowded a certain bus route is at a given time, and have collected the data shown in the graph below. This graph shows the average number of people $P$ on the bus versus the time $t$, in number of hours after 6 AM.

Using this plot, answer the following questions:

a) Knowing the time $t$, can you always determine what $P$ is from this graph? If the time is 8 AM, roughly how many people would you expect to be on the bus?

b) Knowing the number of people on the bus, can you determine what the time is from this graph? If there are 15 people on the bus, roughly what time could it be?

c) Can $P$ be a function of $t$? Can $t$ be a function of $P$? Why or why not?

d) Without calculating any numbers, do you expect the average rate of change of $P$ to be larger between $t = 0$ and $t = 1$, or between $t = 0$ and $t = 4$? Why?

e) Now, estimate the average rates of change between $t = 0$ and $t = 1$, and between $t = 0$ and $t = 4$.

f) Say that you have collected data on the average number of people $Q$ on a different bus line at $t$ hours after 6 AM, and the data is as follows:

<table>
<thead>
<tr>
<th>$t$</th>
<th>0</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q$</td>
<td>5</td>
<td>25</td>
<td>45</td>
</tr>
</tbody>
</table>

Explain how you can tell that $Q$ could be a linear function of $t$, and find a linear formula for $Q$ in terms of $t$.

g) Using f) and assuming $Q$ is a linear function of $t$, give a time interval over which the average rate of change of $P$ is greater than the average rate of change of $Q$ on the same interval, and an interval over which the average rate of change of $P$ is smaller than that of $Q$. Explain your answers.
2. Sam’s Surplus Student Supplies (affectionately called SSSS) sells both water-damaged textbooks and used Michigan T-shirts.

   a) It costs Sam $500 to store all the soggy textbooks, plus $20 for each textbook she acquires. Find a formula for the cost \( R \) (in dollars) of acquiring \( b \) textbooks.

   b) If Sam sells each textbook for $35 dollars, what’s the minimum number of textbooks that Sam has to sell to break even (i.e., not lose money selling textbooks)?

   c) It costs Sam $300 to buy 40 gently used Michigan T-shirts, and $405 to buy 54 T-shirts. Assuming that the cost \( S \) of buying \( t \) T-shirts is a linear function in \( t \), find a formula for \( S \).

   d) Business is slow, and Sam is trying out a new sales tactic, where each textbook comes with a free T-shirt. Now, how many textbooks must Sam sell in order not to lose money?

3. Let \( T(m) \) be the function describing the average rainfall in inches in the Great Michigan Desert in the \( m \)-th month of the year (for example, \( T(1) \) is the average rainfall in January). There’s no rain at all in the months of July, August, and September (it is a desert after all), while there’s at least a little rainfall in every other month; the rainiest month is November, which has 10 inches of rain.

   a) What is the domain of \( T(m) \)?

   b) What can you say about the range of \( T(m) \)?

   c) Evaluate \( T(7) \).

   d) Give practical interpretations for the following quantities or expressions:

   (i) \( T(3) \).

   (ii) \( T(4) = 7 \).

   (iii) \( T(1) = T(12) \).

   (iv) \( \frac{T(5) - T(3)}{5 - 3} \).

   (e) Solve \( T(m) = 0 \), and give a practical interpretation of your answer.