Lesson 2
(Cover 1.2 and 1.3)

Announce/Remind:
Quiz on Student Guide next class
On-line Data Form ((Extra?) Credit on Quiz)

Assignment:
Read: Section **1.4 and "Doing Team Homework"**
Do: WebWork, as usual.
Watch: Team Hwk Tutorial
Team Homework (due at end of the second week)

The most important points for these sections:

- The definition of the average rate of change of a function over an interval. (See pages 11, 13.)
- The symbolic expression for rate of change expressed using function notation. For Q = f(t) over the interval [a,b], students should recognize both of the following expressions for the average rate of change over the interval: $\frac{f(b)-f(a)}{b-a}$ and $\frac{\Delta Q}{\Delta t}$.
- Students should know the average rate of change of $f(x)$ over the interval $[a, b]$ can be represented graphically by the slope of the secant line joining the points $(a, f(a))$ and $(b, f(b))$.
- The definitions of "increasing" and "decreasing" function behavior.
- Given a table of data, students should be able to determine whether or not the relationship could be perfectly linear by calculating the average rate of change between all pairs of points from the table of data to determine whether they always get the same value for the average rate of change.
- Students should know why the formula of a linear function is of the form: $y = b + mx$.
- Given the equation of a linear function and a specific value of the input, students should be able to evaluate the linear function to find the corresponding value of the output.
- Given an accurate picture of the graph of a linear function, students should be able to determine the sign (+ or –) of the slope, m, and intercept, b.
- Given the formula for a linear function in which variables represent real-world quantities, students should be able to interpret the meaning of the slope and intercepts.

00-15 If there are students coming for the first time, give them the handouts from last class and tell them to fill in the online Student Data Form.

Put your class into their team homework groups based on where they live (North Campus, Central Campus, "The Hill", Off Campus). It is up to you if you want students to sit in their Team HW groups every day, but they should stay together today. Give them a few moments to introduce themselves to the others at their table. Have each team give you a list of the names of each person at that table. Explain that you will be assigning the first team homework and would like to talk about the procedures for Team Homework. As you circulate, **make sure all groups have established their first meeting time**. Have them write down their names and first meeting time on a piece of paper for you. (Encourage them to come up with a team name and include this on the paper that they give you.) Pass out the **Reporter page.** Take a few moments to go over the different roles and responsibilities of the team members (found in the Student Guide) and discuss what you are looking for in team homework write-ups. (Make sure YOU have read "Doing Team Homework" and watched "Team Hwk Tutorial" so that you can make the expectations clear.) The first team assignment should be due at the *beginning* of the last day of class next week (or, if you prefer to let them have until Friday (especially if you do not teach on Fridays), you can have it due to you by a specific time (such as 5 pm) on Friday). Make sure that you are clear about the deadline, and then stick to it. Do *NOT* accept late assignments. If you do it even once, it will cause problems.

15-20 Give an outline of what you intend to cover today.

20-35 Tell students that the idea of rate of change (in particular *average* rate of change, since this is not yet calculus) will be addressed throughout the text. Discuss the average rate of change as a change in output over change in input over an interval. The text provides a nice explanation of this and how it can be interpreted.

Make sure to show symbolic and graphical ways of defining the average rate of change. **Section 1.2 #16 on page 16** is a nice problem to do here to demonstrate these.

35-45 The previous example mentions a rate of decrease. Use this to segue into a mini-lecture on the terms *increasing* and *decreasing*. It is fine to point out that if a function is increasing on an interval, then the average rate of change is positive (or if the function is decreasing on an interval, then the average rate of change is negative), but don't fall into the trap of stating the converse. (Note Example 4 on page 14, the part finding the average rate of change between x= -2 and x = 1.) Use $f(x) = 16-x^2$ (just used in #16 on page 16) as an example to demonstrate when the function is increasing and decreasing. Stress the fact that the terminology refers to the behavior of the function as x moves from left to right. Students have sometimes seen arrows on both ends of a graph of things like x^2 and tend to confuse long-term behavior with increasing or decreasing behavior. For this reason, I would definitely *discourage arrows on graphs*--students' or yours.

45-55 Follow up with an example involving tables. Have the students work on **Section 1.2 #12 on page 15** with their group members. Circulate the room and ask student volunteers to present their answers. Make sure to emphasize the interpretation of these answers as in part (b), and make sure students point out which is increasing or decreasing (based on table data).

55-65 Next introduce students to our first family of functions – linear functions. Point out that a linear function is one in which the average rate of change is *constant*. (**Note:** Students are familiar with the general formula for linear functions ($y = b+mx$) but often have not explored this family by considering its presentation by tables and verbal descriptions--or thought a lot about the interpretations of m and b within the context of a problem. The challenge for us is to present the material as fresh and to keep students from thinking that this material is just a rehash of what they have had before.)

Put the following table on the board:

x	-4	-1	0	2
$f(x)$	2	5	8	11
$g(x)$	8	2	0	-4

In their groups, have students determine if either of these functions could be linear. If they do believe the function is linear, have them find a formula for the function.

Wrap up the example by discussing solutions. It is also important at this time to point out that tables give discrete data and we do not know what is going on between the data points. As a result, we can only note that a function *could be* linear based on the data given.

65-80 Next, move to a linear modeling problem such as **Section 1.3 #20 on page 25**. Emphasize that linear functions often arise naturally in the form :

dependent variable = initial value + (rate of change)(independent variable).

For this reason we will write $y = b + mx$ rather than $y = mx + b$, although either form is correct. In their groups, have students work through this problem. When wrapping up the problem, ask for volunteers to interpret the slope and vertical intercept in the formula they found in part (a).

If you still have time… go over **Section 1.3 #27-29 on page 26**.

Before you dismiss your class for the day, remind them about the

- **reading ``Doing Team Homework''**
- **watching ``Team Hwk Tutorial"**
- **quiz on the student guide (next class),**
- **the Gateway,**
- **online student data form.**