

Math 135: Intermediate Algebra

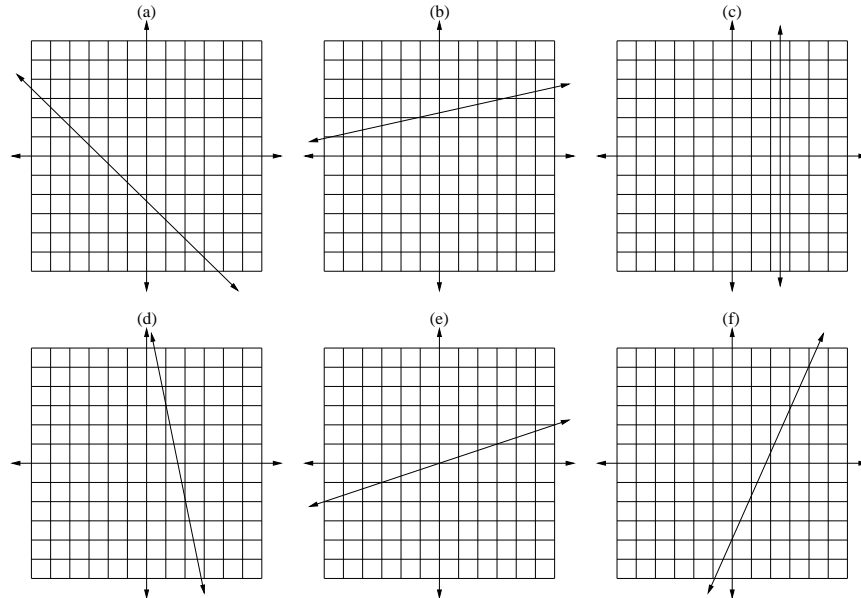
Worksheet 3

Oct 11, 2007

1. Company Z makes widgets.

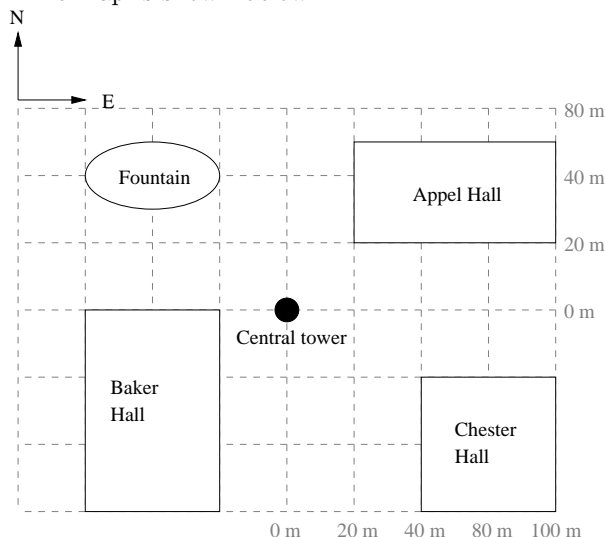
- (a) The company sells widgets for \$50.00 each. Write down a function $R(w)$ and draw a graph showing Company Z's revenue as a function of w , the number of widgets it sells.
- (b) It costs the company \$1000.00 per month to run its widget factory, plus \$10.00 for every widget it makes. Write a function $C(w)$ and draw a graph showing Company Z's costs as a function of w .
- (c) What are the y -intercepts of the two graphs you have just drawn. What are the slopes?
- (d) Suppose the company makes and sells 100 widgets. How much profit (revenue minus cost) does it make?
- (e) Looking at your graphs, find the number of widgets w at which the lines for $R(w)$ and $C(w)$ cross? In words, what is the significance of this point?
- (f) Algebraically, find the number of widgets w where the revenue $R(w)$ is equal to the cost $C(w)$.

2. Fun with graphs – each question below refers to these six graphs. Identify the graph(s), if any, that have:



- (a) Positive slope.
 - (b) y -intercept greater than or equal to zero.
 - (c) The most negative slope.
 - (d) Zero slope.
 - (e) Zero y -intercept.
 - (f) Positive x -intercept.
3. Surveyors make extensive use of the formulae for distance and midpoint. Suppose a surveyor makes a map of an area and uses x to represent distance East of the Central Tower and y to represent distance

North of the Central Tower. The map is shown below.



- What are the coordinates of the corner of Appel Hall closest to the Central Tower?
 - What is the distance from the nearest corner of Chester Hall to the Central Tower?
 - Baker Hall has a door in the center of its East Wall. Find the coordinates of the door.
 - A path leads from the door of Baker Hall to the Central tower. Find the midpoint of the path.
 - How long is a path that runs from the Eastern tip of the fountain to the Southwestern corner of Chester Hall? What is the midpoint of the path?
4. Car 1 leaves Los Angeles at the same time car 2 leaves San Francisco. Suppose car 1 is traveling at 50 miles per hour, and car 2 is traveling at 70 miles per hour. Los Angeles and San Francisco are about 500 miles apart.
- Write a function $d_1(t)$ and draw a graph showing the distance that car 1 has traveled as a function of time t .
 - Write a function $d_2(t)$ and draw a graph showing the distance that car 2 has traveled as a function of time.
 - What are the slopes of the graphs you just drew?
 - Write a function $d(t)$ and draw a graph showing the distance between the two cars as a function of time.
 - What is the slope of the graph of $d(t)$? How does it relate to the slopes of $d_1(t)$ and $d_2(t)$?
 - How long after they have left do the two cars pass each other? You can figure this out using your graphs or algebraically.
 - When the cars pass, how far are they from San Francisco?
5. Income taxes work in “brackets.” A bracket is just a way of specifying the slope of a line. This problem will illustrate that.
- In a certain state, the lowest income tax bracket is 3% on incomes up to \$10,000 per year. Write a function $T_1(I)$ and draw a graph showing the amount of tax as a function of income.
 - What is the domain of $T_1(I)$? What is the range?
 - What is the slope of the graph you just drew?

- (d) The next tax bracket is 5% for income from \$20,001 to \$40,000 per year. Thus, someone would pay 3% on their first \$20,000 of income and 5% on the next \$20,000. For example, a person making \$25,000 per year would pay 3% of \$20,000 and 5% of \$5,000. Write a function $T_2(I)$ showing the amount of tax for incomes from \$20,001 to \$40,000 per year. Graph $T_2(I)$ on the same graph as $T_1(I)$.
- (e) What is the slope of the graph you just drew?
- (f) Where do T_1 and T_2 meet? Explain in words why they meet there.
- (g) The *average* tax someone pays is just defined as their total tax divided by their income. What is the average tax for someone making \$20,000 per year? How about \$30,000 or \$40,000?