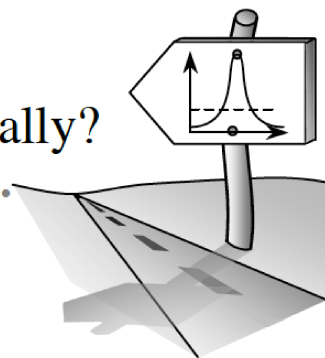# 6.4.1 How does average "look" geometrically?

Mean Value

6-120. GRADUATION TICKETS

The student government needs your help! They wish to distribute graduation tickets to all seniors at your school for family members attending the ceremony. The school will provide enough tickets so that *all* family members can go. However, the student government does not want to tediously count tickets out for each senior - with more than 350 seniors, that would take forever!

Instead, they decided to find the average number of family members for the entire senior class. They will then distribute this average number of tickets to all seniors and allow those seniors who need more tickets to get them from other seniors who have extra.

They need your class to determine the average (mean) number of graduation tickets.

a. With your interlocking cubes, build a tower to represent the size of your immediate family.

b. As a class, stand in a line by family size. By looking at the class this way, estimate the average number of tickets each person should receive.

c. If you graphed this data, what would the bar graph look like?

d. Decide how to re-distribute the cubes so that each person has the average number of cubes. How many tickets should each senior receive?

6-121. In problem 6-120, you found a mean (or average) number of tickets for the members of your class. Summarize how to find an average and explain what an average represents. Include sketches for the bar graph and the average.

6-122. PHONE COMPANY

The local phone company, MVT, wants to find the average number of minutes a typical high school student spends on the phone per day. After surveying nineteen students at random, you have collected the following data:

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Minutes	8	24	33	40	45	49	53	56	58	61	63	65	67	69	71	72	73	75	76
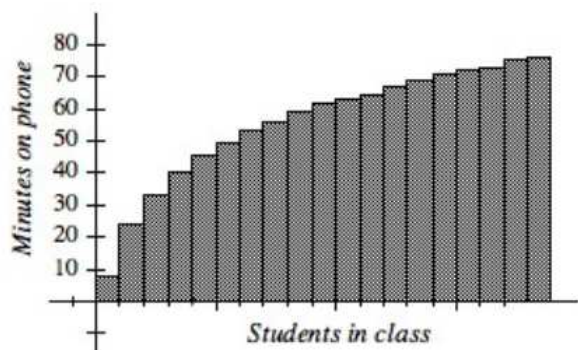
a. Based on the bar graph, estimate the average number of minutes spent per call by these 19 students.

b. Using the table of data, calculate the average number of minutes spent per call. Was your estimate close?

c. How is the total number of minutes from all students represented geometrically in this bar graph?

d. If the bar graph was altered so that each student spent the average number of minutes per call, what would it look like?

6-123. During a trip to school, Steven charted his velocity from home over time, shown below on the graph. For his 25 minute trip, his velocity in feet per minute was:

$$v(t) = -\frac{1}{50}t^4 + t^3 - \frac{31}{2}t^2 + 75t$$
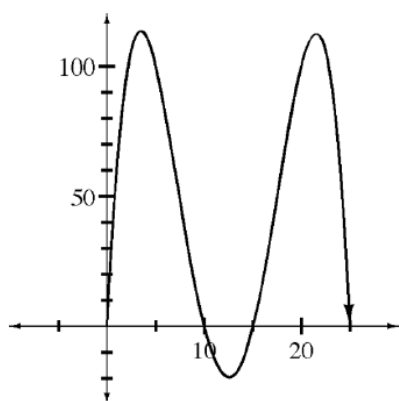
a. How far from school did he live? Explain how you determined your answer.

b. What was his average velocity in feet per minute? Explain how you got your answer.

c. Find the average speed for Steven. Explain why the answer is not the same as in part (b).

d. Locate Steven's velocity graph on the Lesson 6.4.1 Resource page provided by your teacher. Graph Steven's trip if he had traveled at the average velocity during the entire trip. What does this graph look like?

e. Estimate the time(s) during his trip at which he was actually traveling at the average velocity.

6-124. Summarize how to find the average value of *any* function $f(x)$ on an interval $a \leq x \leq b$. Include a sketch of a function $f(x)$ and the average.

6-125. Without your calculator, evaluate the following integrals. <u>Homework Help</u> ✎

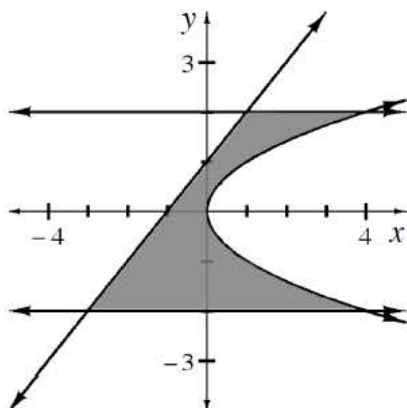a. $\int_{-2}^{1} (10x - 3)\, dx$

b. $\int_{0}^{\pi/3} \sec x \tan x\, dx$

c. $\int_{9}^{25} \sqrt{x}\, dx$

d. $\int_{1}^{e^2} \ln x\, dx$

e. $\int_{0}^{1} \frac{1}{\sqrt{1-x^2}}\, dx$

6-126. The graphs of the equations $x = y^2$, $x = y - 1$, $y = 2$, and $y = -2$ are shown below. These four graphs form the boundary of a region. <u>Homework Help</u> ✎
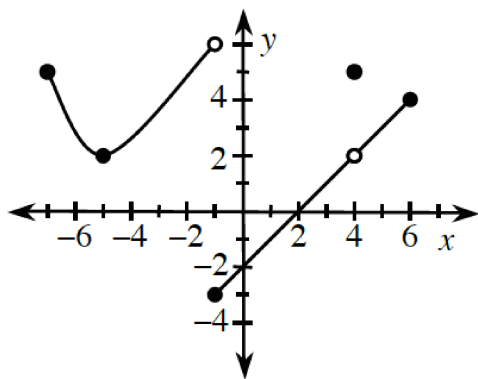
Show that the area of this region is $\frac{28}{3}$ un². Hint: Use horizontal rectangles.

6-127. Suppose that $C(t)$ represents the cost per day to heat your house measured in dollars per day, where t is time measured in days and $t = 0$ corresponds to January 1, 2000. Interpret the expressions below:

$\int_{0}^{31} C(t)\, dt$ and $\frac{1}{31}\int_{0}^{31} C(t)\, dt$. <u>Homework Help</u> ✎

**6-128.** The function $y = g(x)$ is graphed below. <u>Homework Help</u> ✎

a. Find the domain and range.

b. Where is the function continuous? (Hint: It is usually easiest to start with the domain and then *eliminate* where the function is not continuous.)

c. Where does the function appear to be differentiable?

6-129. Find the following limits for $y = g(x)$ graphed in problem 6-128. Homework Help ✎

a. $\lim\limits_{x \to -1^-} g(x)$

b. $\lim\limits_{x \to -1^+} g(x)$

c. $\lim\limits_{x \to -1} g(x)$

d. $\lim\limits_{x \to -5} g(x)$

e. $\lim\limits_{x \to 4^+} g(x)$
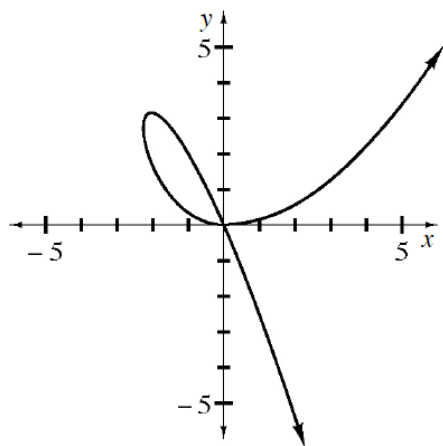
f. $\lim\limits_{x \to 4} g(x)$

6-130. Trace the distance-time graph and the tangent at $t = 1$ second on your paper. Distance$d$ is measured in feet. Homework Help ✎
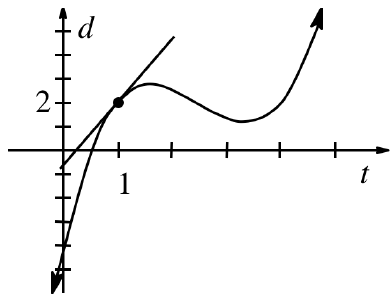
a. Estimate the velocity at $t = 1$ sec.

b. Find another time on the graph where the object has the same velocity. Show on your graph how
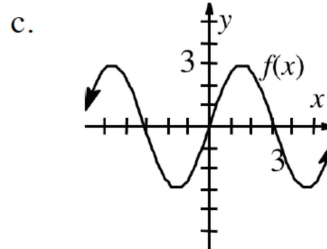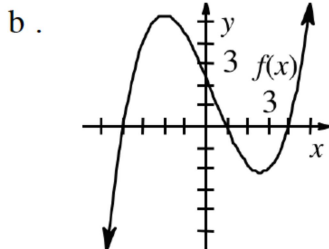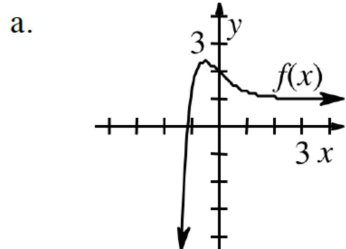
you know the velocities are equal.

6-131. The graph of $x^3 = 5xy + 2y^2$ is shown below.   <u>Homework Help</u> ✎

a. How many tangent lines exist at $x = -2$?

b. Find the equations of the tangent lines at $x = -2$.

6-132. For each graph below: <u>Homework Help</u> ✎

i. Trace $f(x)$ on your paper and write a slope statement for $f(x)$.

ii. Sketch the graph of $f'(x)$ using a different color.

a.

b.

c.

6-133. Find $F'(x)$.   <u>Homework Help</u> ✎

a. $F(x) = \int_5^{x^2} \cos(\ln t)\, dt$

b. $F(x) = \int_{\sin x}^{\cos x} \frac{1}{t^2+1}\, dt$