Section 2.4
Solutions and Hints

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for the book:

Precalculus, Mathematics for Calculus 4th Edition
by James Stewart, Lothar Redlin and Saleem Watson.

This section is all about average rate of change. While the book makes it seem complicated it is not. Here it is easy:

1. You have some function f(x).
2. You pick two x values say x1 and x2.
3. You then put those two values into f(x) and get f(x1) = y1 and f(x2) = y2.
4. You then calculate the slope of the line from (x2, y2) to (x1, y1).
5. This slope is the average rate of change of f(x) from x1 to x2.

20. A man is running around a circular track 200 meters in circumference. An observer uses a stopwatch to time each lap, obtaining the following data:

Time in seconds	Distance in meters
32	200
68	400
108	600
152	800
203	1000
263	1200
335	1400
412	1600

20 a. What was the man's average speed (rate) between 68 s and 152 s?

So x1 = 68 → y1 = 400
x2 = 152 → y2 = 800

avg rate = (y2 – y1) / (x2 – x1) = (800 – 400) / (152 – 68) = 100/21 ~= **4.7619 m/s**

20 b. What was the man's average speed between 263 s and 412 s?

So x1 = 263 → y1 = 1200
x2 = 412 → y2 = 1600

avg rate = (y2 – y1) / (x2 – x1)
= (1600 – 1200) / (412 – 263)
= 400/19 ~= **2.6846 m/s**

20 c. Calculate the man's speed for each lap.
Is he slowing down, speeding up or neither?

Time in seconds	Distance in meters	Average Speed (rate) in m/s
32	200	(200 – 0)/(32 – 0) = 25/4 ~= **6.25**
68	400	(400 – 200)/(68-32) = 50/9 ~= **5.56**
108	600	(600 – 400)/(108-68) = **5**
152	800	(800 – 600)/(152 – 108) = 50/11 ~= **4.55**
203	1000	200/(203 – 152) = 200/11 ~= **3.92**
263	1200	200 / (263 – 203) = 10/3 ~= **3.33**
335	1400	200 / (335 – 263) = 25/9 ~= **2.78**
412	1600	200 / (412 – 335) = 200/77 ~= **2.60**

Every lap the man's average speed is decreasing thus **he is slowing down every lap.**