Today

pp.116-117 #2, 3, 5*an estimate is required only, 6a*find the quadratic equation first then use the preceding interval method, 8, 9, 10, 11ab*use the algebraically simplified DQ, 13

p.118 (45 minutes max) #1,2,3,4a* use the algebraically simplified DQ

Recent Homework

Thurs. Sept. 21

p.86 #2bc, 4a

Use the ALGEBRAICALLY SIMPLIFIED DIFFERENCE QUOTIENT FOR ALL RATE OF CHANGE CALCS

pp.86-89 #4c, 5, 10* do not approximate Pi + Challenge given in class

Mon. Sept. 25

ENTERTAINMENT: pp.103-106 #1, 2*, 3 to 9*10, 11, 14

* in #2, the answer in the back has a small error. Do you know what it is?

Also, the answer for #9 in the back has some mistakes.

p.86 #10

10. T To make a snow person, snow is being rolled into the shape of a sphere. The volume of a sphere is given by the function $V(r) = \frac{4}{3}\pi r^3$, where r is the radius in centimetres. Use two different methods to estimate the instantaneous rate of change in the volume of the snowball with respect to the radius when $r = 5$ cm.

$$\text{iroc} = \frac{f(x+h)-f(x)}{h},\ h\to 0$$

$$= \frac{f(5+h)-f(5)}{h},\ h\to 0$$

$$= \frac{\frac{4}{3}\pi(5+h)^3 - \frac{4}{3}\pi(5)^3}{h},\ h\to 0$$

$$= \frac{\frac{4}{3}\pi\left(5^3+3(5)^2h+3(5)h^2+h^3\right) - \frac{4}{3}\pi(5)^3}{h},\ h\to 0$$

$$= \frac{\frac{4}{3}\pi\left(125+75h+15h^2+h^3\right) - \frac{4}{3}\pi(125)}{h},\ h\to 0$$

$$= \frac{\frac{4}{3}\pi(125)+100\pi h+20\pi h^2+\frac{4}{3}\pi h^3 - \frac{4}{3}\pi(125)}{h},\ h\to 0$$

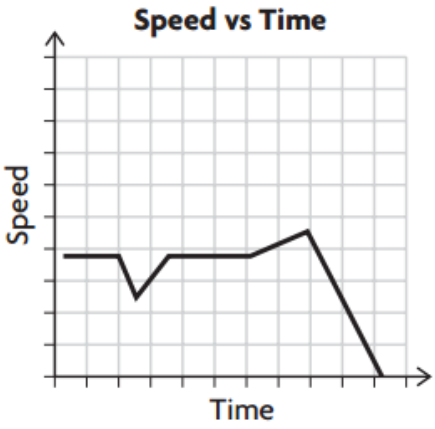
$$= \frac{h\left(100\pi+20\pi h+\frac{4}{3}\pi h^2\right)}{h},\ h\to 0$$

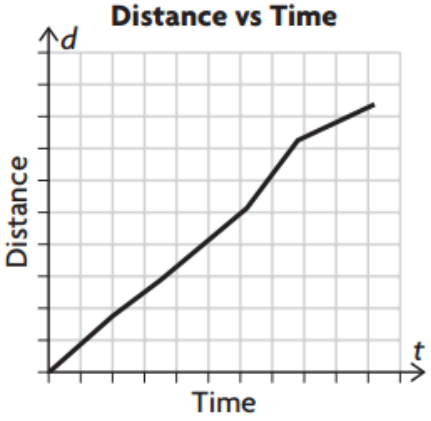
$$= 100\pi+20\pi h+\frac{4}{3}\pi h^2,\ h\to 0$$

$$= 100\pi \text{ cm}^3/\text{cm}$$

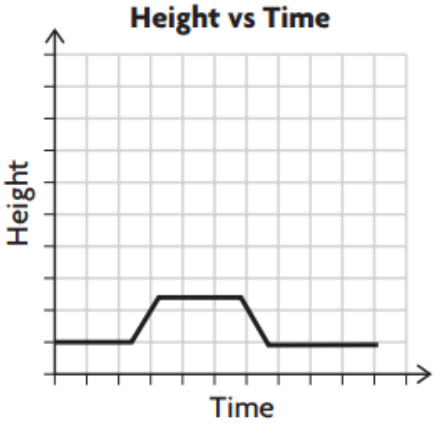
p.104 #6

6. a)


Speed vs Time
Speed
Time

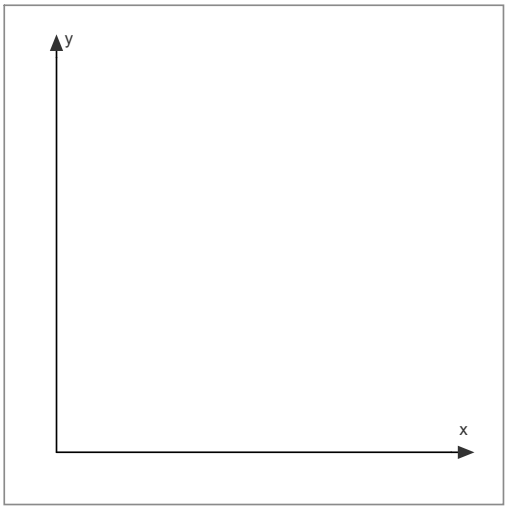

Distance vs Time
d
Distance
t
Time

b)

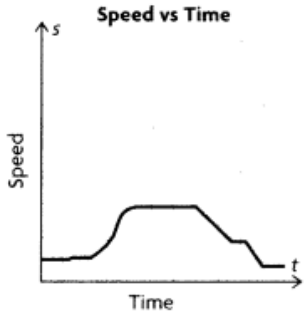

Height vs Time
Height
Time

p.105 #9

9. T A jockey is warming up a horse. Whenever the jockey has the horse accelerate or decelerate, she does so at a nonconstant rate—at first slowly and then more quickly. The jockey begins by having the horse trot around the track at a constant rate. She then increases the rate to a canter and allows the horse to canter at a constant rate for several laps. Next, she slowly begins to decrease the speed of the horse to a trot and then to a walk. To finish, the jockey walks the horse around the track once. Draw a speed versus time graph to represent this situation.



9. Answers may vary. For example: Because the jockey is changing the horse's speed at a non-constant rate—at first slowly and then more quickly—the lines will have an upward curve when the horse is accelerating and a downward curve when decelerating. The horse's speed during the first part of the warm up is constant, which would be represented by a straight line. She then increases the horse's speed to a canter and keeps this rate for a while. Draw a graph of this information with speed over time.



p.106

11. A cross-country runner is training for a marathon. His training program requires him to run at different speeds for different lengths of time. His program also requires him to accelerate and decelerate at a constant rate. Today he begins by jogging for 10 min at a rate of 5 miles per hour. He then spends 1 min accelerating to a rate of 10 miles per hour. He stays at this rate for 5 min. He then decelerates for 1 min to a rate of 7 miles per hour. He stays at this rate for 30 min. Finally, to cool down, he decelerates for 2 min to a rate of 3 miles per hour. He stays at this rate for a final 10 min and then stops.

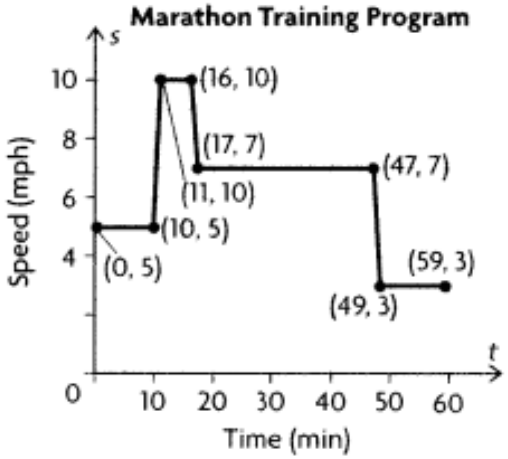
a) Make a speed versus time graph to represent this situation.

b) What is the instantaneous rate of change in the runner's speed at 10.5 min?

c) Calculate the runner's average rate at which he changed speeds from minute 11 to minute 49.

d) Explain why your answer for part c) does not accurately represent the runner's training schedule from minute 11 to minute 49.

11. a) Answers may vary. For example: Draw a graph of the runner's speed over time. The runner's positions on the graph will be represented by the following points: (0, 5), (10, 5), (11, 10), (16, 10), (17, 7), (47, 7), (49, 3), (59, 3). Plot the points on a graph. Because the runner accelerates and decelerates at a constant rate, the lines will always be straight.



b) Use the data points on either side of $t = 10.5$ to estimate the instantaneous rate of change at that point. The points are (10, 5), (11, 10).

$$\frac{10 - 5}{11 - 10} = 5 \text{ mi/h/min}$$

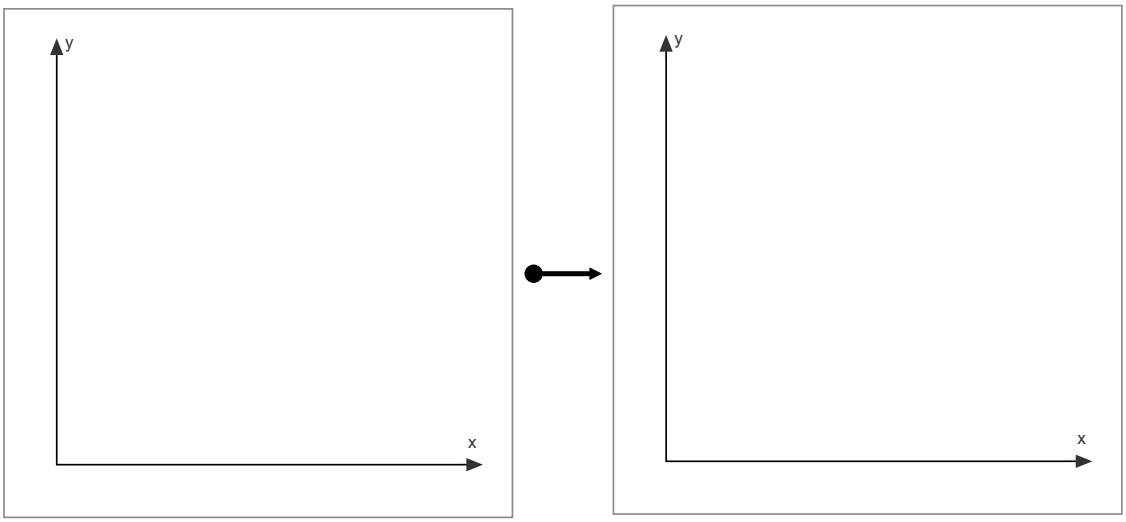
c) The runner's speed at minute 11 is 10 miles per hour. The runner's speed at minute 49 is 3 miles per hour.

$$\frac{3 - 10}{49 - 11} = \frac{-7}{38} = -0.1842 \text{ miles per hour per minute}$$

d) The answer to part c) is an average rate of change over a long period, but the runner does not slow down at a constant rate during this period.

p.106 #14

14. A graph displays changes in rate of speed versus time. The graph has straight lines from point to point. If the graph had been drawn to display changes in distance versus time, how would it be different?



Speed versus Time

Distance versus Time

14. If the original graph showed an increase in rate, it would mean that the distance travelled during each successive unit of time would be greater—meaning a graph that curves upward. If the original graph showed a straight, horizontal line, then it would mean that the distance travelled during each successive unit of time would be greater—meaning a steady increasing straight line on the second graph. If the original graph showed a decrease in rate, it would mean that the distance travelled during each successive unit of time would be less—meaning a line that curves down.