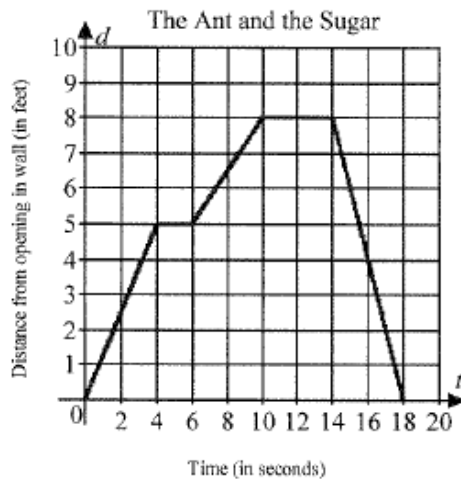


The Ant and the Sugar (Calculus Style)

At time $t = 0$ seconds, a worker ant crawls onto the countertop from the wall entrance. The ant follows the trail for four seconds and travels 5 feet. The ant then stops for two seconds to check for danger. It continues on the path and arrives at the sugar four seconds later. It collects sugar for four seconds then crawls directly back to the wall entrance. The worker ant is on the kitchen counter for 18 seconds.

1. Discuss how the graph describes the story.



2. Is the ant continuously moving?
3. How far does the ant travel from the beginning of its journey to the end?
4. Determine the slope of each segment of the ant's journey.

| Time(in seconds) | Slope |
|------------------|-------|
| 0 – 4 seconds | |
| 4 – 6 seconds | |
| 6 – 10 seconds | |
| 10 – 14 seconds | |
| 14 – 18 seconds | |

5. What are the units for each of the slopes you listed?
6. Is there a slope at every point during the 18 seconds the ant is away from the wall? If there is not, where?
7. Find the slope of the line connecting the point $(6, 5)$ and the point $(14, 8)$.

8. Use the information in #2 to create a graph that is a piecewise step function.

9. What information does this graph tell you about the ant?

10. On the graph you drew in #6 find the area between each piece and the x-axis.

11. Add up the absolute value of the areas you found in #8.

12. Compare your answer to the answer you found in #2.

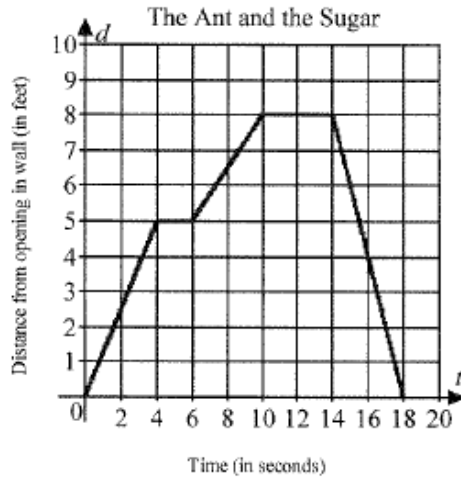
13. So how is total distance related to area under a curve.

How does this look in Calculus class.

| | | | | | | |
|----------------|---|---|---|----|----|----|
| Time(seconds) | 0 | 4 | 6 | 10 | 14 | 18 |
| Distance(feet) | 0 | 5 | 5 | 8 | 8 | 0 |

1. Determine the average rate of change on the interval $[6, 14]$.

Find the slope of the line connecting the point $(6, 5)$ and the point $(14, 8)$.



2. Determine if the graph is continuous. If it is not, explain.

Is the ant continuously moving?

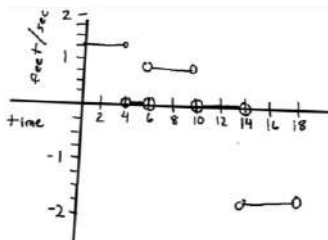
3. Determine if the graph is differentiable on the interval $0 < t < 18$.

Is there a slope at every point during the 18 seconds the ant is away from the wall? If there is not, where?

4. Is this consistent with the Mean Value Theorem.

Is the ant continuously moving?

Is there a slope at every point during the 18 seconds the ant is away from the wall? If there is not, where?



5. Use the graph above to find $\int_0^{18} |f'(t)| dt$. Explain what it means in the context of the problem.

How far does the ant travel from the beginning of its journey to the end?