

## Math 111 Extra Functional Notation Practice

Below is a simpler version of the Distance, ATS, and AS problems that we discussed in lecture today. Please use it as an additional review when you start the homework (I also encourage you to check out the Week 5 review on my website).

**The answer to the questions below are on the next page, so try not to peek.**

Assume that the distance traveled by a car at time  $t$  is given by

$$D(t) = 3t^2,$$

where  $t$  is in hours and  $D(t)$  is in miles.

Try the following questions:

1. Find and simplify the formula for ATS at time  $t$ .
2. Find and simplify the formula for AS over the five-hour interval starting at  $t$ .
3. Find the ATS at  $t = 2$ .
4. Find the AS from  $t = 10$  to  $t = 15$ .
5. Find a time when the ATS is 18 mph.
6. Find a five-hour interval when AS is 37 mph.

ANSWERS

1. Find and simplify the formula for ATS at time  $t$ .

$$ATS(t) = \frac{D(t)}{t} = \frac{3t^2}{t} = 3t$$

$$ATS(t) = 3t.$$

2. Find and simplify the formula for AS over the five-hour interval starting at  $t$ .

$$\begin{aligned} AS \text{ from } t \text{ to } t + 5 &= \frac{D(t+5) - D(t)}{5} = \frac{[3(t+5)^2] - [3t^2]}{5} \\ &= \frac{[3(t^2 + 10t + 25)] - [3t^2]}{5} \\ &= \frac{[3t^2 + 30t + 75] - [3t^2]}{5} \\ &= \frac{3t^2 + 30t + 75 - 3t^2}{5} \\ &= \frac{30t + 75}{5} = \frac{30t}{5} + \frac{75}{5} \\ &= 6t + 25. \end{aligned}$$

$$AS \text{ from } t \text{ to } t + 5 = 6t + 25.$$

3. Find the ATS at  $t = 2$ .

We can plug in  $t = 2$  into the formula we found in part (1).

$$ATS(2) = 3(2) = 6 \text{ mph.}$$

4. Find the AS from  $t = 10$  to  $t = 15$ .

We can plug  $t = 10$  into the formula we found in part (2).

$$AS \text{ from } t = 10 \text{ to } t = 15 = 6(10) + 25 = 85 \text{ mph.}$$

5. Find a time when the ATS is 40 mph.

We want to solve when  $ATS(t) = 40$  using the formula from part (1).

$$ATS(t) = 40$$

$$3t = 40$$

$$t = \frac{40}{3} \text{ hours.}$$

6. Find a five-hour interval when AS is 37 mph.

We want to solve when the AS over a five-hour interval is 37 using the formula from part (2).

$$AS \text{ from } t \text{ to } t + 5 = 37$$

$$6t + 25 = 37$$

$$6t = 12$$

$$t = 2 \text{ hours.}$$

The AS is 37 mph from  $t = 2$  to  $t = 7$  hours.