1. [10 points] The dogs Elvis and Judy are playing with their owner.

At time t = 0 seconds, Elvis starts to run in a straight line away from his owner. After running 110 feet, Elvis turns around and runs back to his owner along the same straight line. Some values of the differentiable function E(t), which gives Elvis's distance from his owner, in feet, at time t seconds, are recorded in the table below. Assume that Elvis's velocity is positive when he is moving away from his owner.

t	2	5	7	10	12	15	17	18
E(t)	33	78	98	98	74	44	34	10

a. [2 points] What was Elvis's average velocity between times t = 12 and t = 17? Include units.

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υ	\mathbf{u}	u	\mathcal{U}	10.

E(17) - E(12)	34 - 74	_ 8
17 - 12	5	0

Answer: -8 ft/sec

b. [2 points] Estimate Elvis's instantaneous velocity at t = 5. Include units.

Solution:

$$E'(5) \approx \frac{E(7) - E(5)}{7 - 5} = \frac{98 - 78}{2} = 10$$

Answer: ______10 ft/sec

- c. [2 points] For which of the following time interval(s) must E'(t) = 0 for some value of t in that time interval? Give your answer as a list of <u>one or more</u> of these intervals, or write NONE.
 - (2,5) (6,9) (7,10) (15,17)

Judy is also running along a straight line, sometimes away from and sometimes back toward her owner. The function J(t) gives Judy's distance from her owner, in feet, at time t seconds. Some values of J'(t), the <u>derivative</u> of J(t), are given in the table below. Assume that J'(t) is continuous, decreasing on the interval (4, 11), and increasing on the interval (11, 22).

t	4	7	8	11	15	17	20	22
J'(t)	10	2	0	-12	-3	0	1	9

- **d**. [2 points] On which of the following time interval(s) is Judy running away from her owner? Give your answer as a list of <u>one or more</u> of these intervals, or write NONE.
 - (4,7) (8,11) (11,15) (20,22)
- e. [2 points] At which of the following times is Judy's speed the greatest? Write the <u>one</u> correct answer.
 - t = 4 t = 11 t = 17 t = 20