7. [10 points] Two housecats, Jasper and Zander, escape from their house at the same time and travel along a straight line between their house and a tree. Let $J(t)$ (respectively $Z(t)$) be Jasper's (respectively Zander's) distance, in feet, from the tree t seconds after escaping. The table below shows some of the values of $J(t)$ and $Z(t)$. Assume that $J(t)$ is invertible.

t	6	17	22	31	37
$J(t)$	41	33	21	14	2
$Z(t)$	39	32	31	36	43

a. [2 points] What is Jasper's average velocity for $6 \le t \le 22$? *Be sure to include units.*

Answer: $\frac{21-41}{22-6} = -\frac{20}{16} = -\frac{5}{4} = -1.25$ **ft/sec.**

b. [2 points] Estimate $Z'(31)$. *Remember to show your work.*

You can approximate it using either:

- Average rate of change in $[31, 37]$: $\dfrac{43-36}{37-31} = 7/6$.
- Average rate of change in $[22, 31]$: $\dfrac{36-31}{31-22} = 5/9$.
- Averaging these two: $\frac{1}{2}(7/6 + 5/9) = 0.86\overline{1}$, or
- Average rate of change in $[22, 37]$: $\dfrac{43-31}{37-33} = 0.8$.

Answer: (picking one) 7/6

c. [3 points] Circle the one statement below that is best supported by the equation

$$Z(J^{-1}(8) - 4) = 34.$$

i. 34 seconds after escaping, Zander is 4 feet closer to the tree than Jasper was 8 seconds after escaping.

ii. Four seconds before Jasper is 8 feet from the tree, Zander is 34 feet from the tree.

iii. When Jasper is 4 feet further from the tree than he was 8 seconds after escaping, Zander is 34 feet from the tree.

iv. When Jasper is 4 feet closer to the tree than he was 8 seconds after escaping, Zander is 34 feet from the tree.

v. Four seconds after Jasper is 8 feet from the tree, Zander is 34 feet from the tree.

d. [3 points] Circle the one statement below that is best supported by the equation

$$(J^{-1})'(3) = -0.2.$$

i. In the third second after leaving the house, Jasper travels about 0.2 feet.

ii. When Jasper is 3 feet from the tree, he is traveling about 0.2 feet/second slower than he was one foot earlier.

iii. Jasper gets about 1.5 feet closer to the tree during the third second after leaving the house.

iv. It takes Jasper about one-tenth of a second to go from 3 feet to 2.5 feet from the tree.

v. One-half of a second before Jasper was 3 feet from the tree, he was about 2.9 feet from the tree.