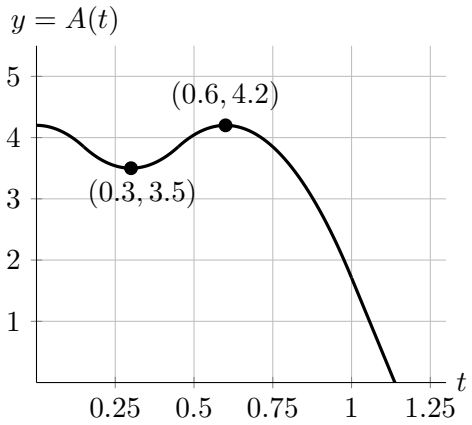
**3**. [13 points] Tom organizes another meeting of his Science Club, but this time only Anne and John can make it. The meeting is at 2 pm, so they both start walking from their houses to Tom's at 1 pm. At 1:18 pm, Anne realizes she forgot her wallet, so she goes back home to get it before heading over to Tom's house.

Anne's distance in kilometers, $A(t)$, and John's distance in kilometers, $J(t)$, to Tom's house $t$ hours after 1 pm are given by the graph and the table below. Assume that both of them walk along a straight line.

| $t$ | 0 | 0.2 | 0.4 | 0.5 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|
| $J(t)$ | 5.5 | 4.3 | 3.2 | 2.8 | 0.8 | 0 |




**a**. [1 point] How many kilometers from Tom's house is Anne's house?

*Solution:* 4.2 km.

**b**. [2 points] Estimate $J'(0.4)$. Show all your computations. Include units.

*Solution:* $J'(0.4) \approx \dfrac{2.8-3.2}{0.5-0.4} = -\dfrac{0.4}{0.1} = -4$ kilometers per hour.

**c**. [3 points] Rank John's average velocity over the time intervals

(I) $0.2 \le t \le 0.4$ (II) $0.5 \le t \le 0.9$ (III) $0.8 \le t \le 0.9$

from least to greatest. Show your work and indicate your final answer by filling in the blanks with I, II, III.

*Solution:* $[0.2, 0.4]$: $\dfrac{3.2-4.3}{0.2} = -5.5$, $[0.5, 0.9]$: $\dfrac{0-2.8}{0.4} = -7$,

$[0.8, 0.9]$: $\dfrac{0-0.8}{0.1} = -8$ III $\le$ II $\le$ I.

**d**. [2 points] What was the total distance travelled by Anne?

*Solution:* distance=$2(0.7) + 4.2 = 5.6$ kilometers.

**e**. [2 points] At which of the following times was Anne's speed the largest? Circle the correct answer(s).

*Solution:*

$t = 0.05$ $t = 0.3$ $t = 0.4$ $t = 0.6$ $\boxed{t = 1}$

**f**. [3 points] On which of the following intervals is $A(t)$ invertible? Circle the correct answer(s).

*Solution:*

$[0, 0.6]$ $\boxed{[0.3, 0.6]}$ $[0.1, 0.5]$ $\boxed{[0.6, 1]}$ $[0, 1]$