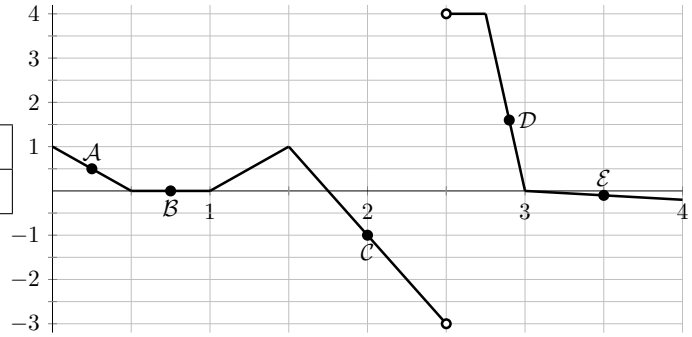
5. [10 points] We tracked the Cheshire Kid far out in the desert as he attempted to find buried gold. After checking his map at time $t = 0$, the Cheshire Kid moved *only* in the north/south direction, with the function $D(t)$ giving his position in kilometers north of his starting point t hours after he checked his map at time $t = 0$. We now consider the following graph of the **derivative** $D'(t)$, along with a table to the left that shows a few values of $D(t)$.

t	1	1.5	1.75	2
$D(t)$	0.25	0.5	0.625	0.5



a. [2 points] At time $t = 2$, is the Cheshire Kid *north* or *south* of his position at $t = 1$? By how much? Give your answer by circling NORTH or SOUTH and filling in the appropriate number of kilometers in the sentence below:

Solution: At $t = 2$, he is $\boxed{0.25}$ kilometers ($\boxed{\text{NORTH}}$ / SOUTH) of his position at $t = 1$.

b. [2 points] Find all times t for $0 < t < 4$ when the Cheshire Kid is traveling at his maximum *speed*. Give your answer as value(s) and/or interval(s) of t.

Solution: $2.5 < x \leq 2.75$ or $(2.5, 2.75]$

c. [2 points] Rank the points $\mathcal{A}$, $\mathcal{B}$, $\mathcal{C}$, $\mathcal{D}$, and $\mathcal{E}$ (as shown on the graph) in order of *descending velocity*, i.e., starting with the point where the Cheshire Kid's velocity is *greatest* and ending with the point where it is *least*.

Solution: $\mathcal{D}$, $\mathcal{A}$, $\mathcal{B}$, $\mathcal{E}$, $\mathcal{C}$

d. [2 points] Find the average velocity of the Cheshire Kid over the time interval $[1, 2]$. *Include units.*

Solution: $\frac{D(2)-D(1)}{2-1} = \frac{0.5-0.25}{2-1} = 0.25$ km/hr

e. [2 points] Circle all of the following intervals over which the Cheshire Kid is always traveling *south*:

$(0, 0.5)$ $(1.5, 2)$ $\boxed{(2, 2.5)}$ $(2.5, 3)$ $\boxed{(3.5, 4)}$ NONE OF THESE