1 - SUM IT UP: Motion Problems (calculator)

A particle moves along the $x - axis$ so that its velocity v at time t, for $0 \leq t \leq 5$ is given by

$$v(t) = \ln(t^2 - 3t + 3)$$

The particle is at position $x = 8$ at time $t = 0$.

Find the acceleration at time $t = 4$.

1. _____

Find all times t in the open interval $0 < t < 5$ at which the particle changes direction.
At what time does the particle begin to travel left?

2. _____

Find the position of the particle at time $t = 2$.

3. _____

Find the average speed of the particle over the time interval $0 \leq t \leq 2$.

4. _____

Sum: _____

2 - SUM IT UP: Motion Problems (non-calculator)

Ben rides a unicycle back and forth along a straight east-west track. The twice differentiable function B models Ben's position on the track, measured in meters from the western end of the track, at time t, measured in seconds from the start of the ride. The table above gives values for $B(t)$ and Ben's velocity, $v(t)$, measured in meters per second, at selected times t.

t (seconds)	0	10	40	60
$B(t)$ (meters)	100	136	9	49
$v(t)$ (meters per second)	2.0	2.3	2.5	4.6

Use the data in the table to approximate Ben's acceleration at $t = 5$ seconds. Indicate units of measure.

1. _____

Using correct units, interpret the meaning of $\int_0^{60} |v(t)|dt$ in the context of this problem. Approximate $\int_0^{60} |v(t)|dt$ using a left Reimann sum with the subintervals indicated by the data in the table.

2. _____

Using correct units, interpret the meaning of $\int_0^{60} v(t)\,dt$ in the context of this problem. Approximate $\int_0^{60} v(t)dt$ using a Trapezoidal sum with the subintervals indicated by the data in the table.

3. _____

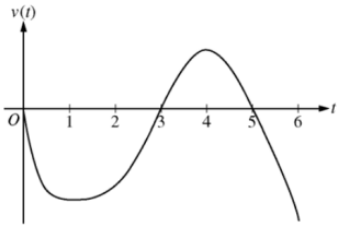
A light is directly above the western end of the track. Ben rides so that at time t, the distance $L(t)$ between Ben and the light satisfies $\big(L(t)\big)^2 = 12^2 + \big(B(t)\big)^2$. At what rate is the distance between Ben and the light changing at time $t = 40$.

4. _____

Sum: _____

3 - SUM IT UP: Motion Problems (non-calculator)

A particle moves along the $x - axis$ so that its velocity at time t, for $0 \leq t \leq 6$, is given by the differentiable function v whose graph is shown. The velocity is zero at $t = 0, 3,$ and 5, and the graph has horizontal tangents at $t = 1,$ and 4. The area of the regions bounded by the $t - axis$ and the graph of v on the intervals $[0, 3]$, $[3, 5]$, and $[5, 6]$ are 8, 3 and 2, respectively. At time $t = 0$, the particle is at $x = -2$.



Graph of v

For $0 \leq t \leq 6$, find both the **time** and **position** of the particle when the particle is farthest to the left. Justify your answer.

1. $_t =$_____

2. $_x =$_____

For how many values of t, where $0 \leq t \leq 6$, is the particle at $x = -8$? Explain your reasoning.

3. _____

What is the average velocity of the particle for $0 \leq t \leq 6$.

4. _____

Sum: _____