

Name: \_\_\_\_\_  
AP Calculus AB: Total Distance

Date: \_\_\_\_\_  
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Let  $s(t)$  represent the position of a particle at time  $t$ . We know that  $s'(t) = v(t)$ . In other words,

What does  $\int_{t_1}^{t_2} v(t) dt$  represent?

How would we find the total distance traveled by the particle over the interval  $[t_1, t_2]$ ?

Therefore, total distance =

If  $v \geq 0$ ,

Examples:

1. A particle moves along the  $x$ -axis according to  $s(t) = 2t^3 - 21t^2 + 60t - 14$ . Find the total distance traveled from  $t = 0$  to  $t = 7$ .

2. A particle moves along the  $x$ -axis with acceleration  $a(t) = 2t - 3$ ,  $t \geq 0$ . At  $t = 0$ ,  $v = 2$ . Find the total distance traveled from  $t = 0$  to  $t = 3$ .