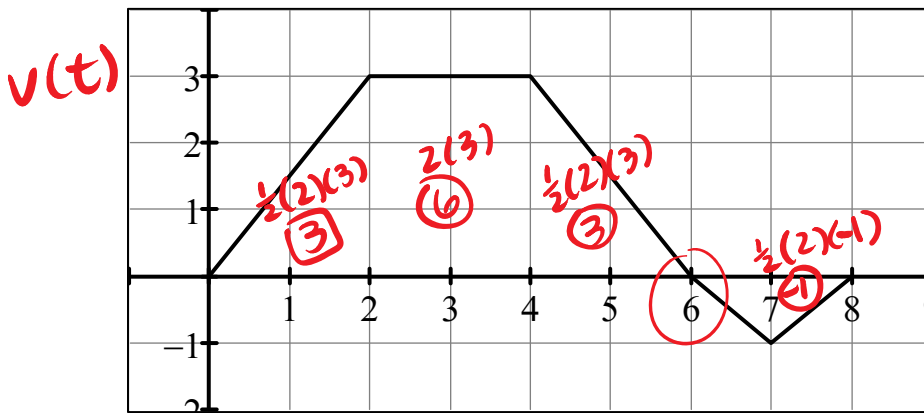


**Multiple Choice**  
**(No Calculator)**

For #1 – 2, use the given graph and information.



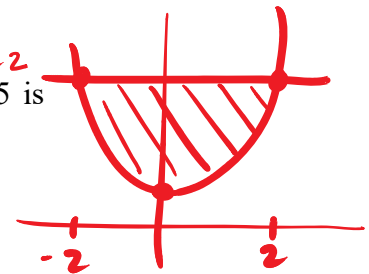
A bug begins to crawl up a vertical wire at time  $t = 0$ . The velocity  $v$  of the bug at time  $t$ ,  $0 \leq t \leq 8$ , is given by the function whose graph is shown above.

1. At what value of  $t$  does the bug change direction? *when  $v(t)$  changes from + to - or - to +*  
 A) 2      B) 4      **C) 6**      D) 7      E) 8

2. What is the total distance the bug traveled from  $t = 0$  to  $t = 8$ ?  *$\int_0^8 |v(t)| dt$*   
 A) 14      **B) 13**      C) 11      D) 8      E) 6

3. The area of the region enclosed by the graph of  $y = x^2 + 1$  and the line  $y = 5$  is  *$x^2 + 1 = 5$   
 $x^2 = 4$   $x = \pm 2$*   
 A)  $\frac{14}{3}$       B)  $\frac{16}{3}$       C)  $\frac{28}{3}$       **D)  $\frac{32}{3}$**       E)  $8\pi$

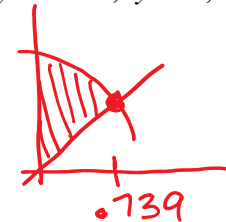
*$A = \int_{-2}^2 (5 - (x^2 + 1)) dx = \int_{-2}^2 (4 - x^2) dx$   
 (Calculator OK)  $= [4x - \frac{1}{3}x^3]_{-2}^2$*



4. What is the area of the region in the first quadrant enclosed by the graphs of  $y = \cos x$ ,  $y = x$ , and the y-axis?

- A) 0.127      B) 0.385      **C) 0.400**      D) 0.600      E) 0.947

*$A = \int_0^{0.739} (\cos x - x) dx$*



5. At time  $t \geq 0$ , the acceleration of a particle moving on the x-axis is  $a(t) = t + \sin t$ . At  $t = 0$ , the velocity of the particle is  $-2$ . For what value of  $t$  will the velocity of the particle be zero? *initial val*

- A) 1.02      **B) 1.48**      C) 1.85      D) 2.81      E) 3.14

*$v(t) = \frac{1}{2}t^2 - \cos t - 1 = 0$*

*$v(t) = \int a(t) dt = \frac{1}{2}t^2 - \cos t + C$   
 $v(0) = \frac{1}{2}(0)^2 - \cos(0) + C = -2$   
 $-1 + C = -2$   
 $C = -1$*