

# WARM UP

1.

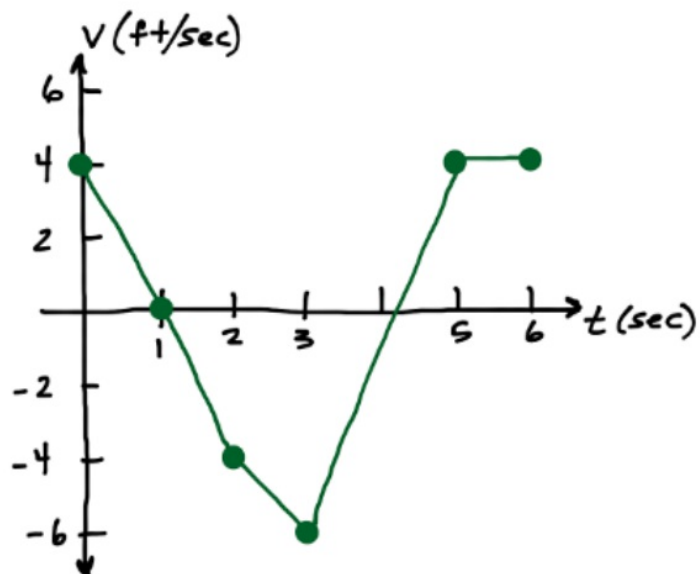
The functions  $f$  and  $g$  are continuous for all real numbers. The function  $h$  is given by  $h(x) = f(g(x)) - x$ . The table below gives values of the functions at selected values of  $x$ . Explain why there must be a value of  $u$  for  $1 < u < 4$  such that  $h(u) = -1$ .

|        |   |   |    |   |
|--------|---|---|----|---|
| $x$    | 1 | 2 | 3  | 4 |
| $f(x)$ | 0 | 8 | -3 | 6 |
| $g(x)$ | 3 | 4 | 1  | 2 |

2. Find  $dy/dx$ :  $y = \sin \sqrt[3]{x} + \sqrt[3]{\sin x}$

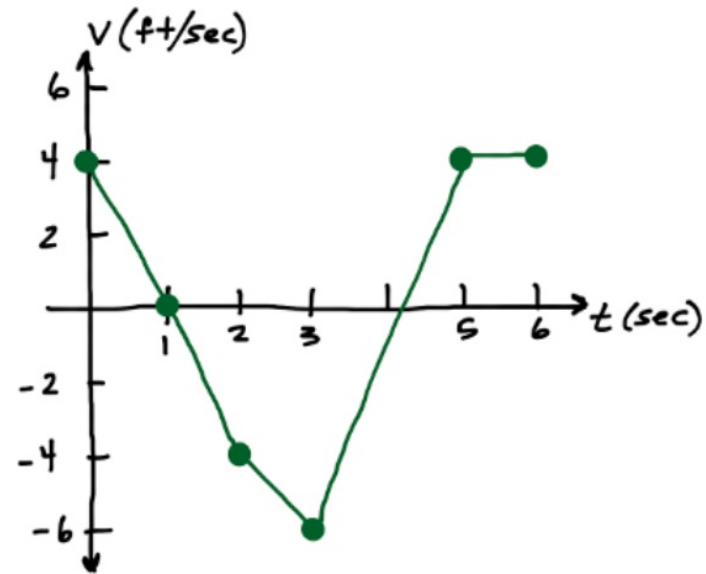
# Objective:

- Interpret velocity and acceleration from graphs and tables.



The graph above shows the velocity  $v(t)$  of a particle, in ft/sec, moving along a horizontal line for  $0 \leq t \leq 6$  seconds.

- (a) On what open intervals or at what time(s)  $0 < t < 6$  is the particle at rest? Justify.
- (b) On what open intervals  $0 < t < 6$  is the particle moving to the right? Justify.
- (c) On what open intervals or at what time(s)  $0 < t < 6$  is the particle moving at its greatest speed? Greatest velocity?



- (d) On what open intervals or at what time(s)  $0 < t < 6$  is the particle's speed increasing? Decreasing? Justify.
- (e) What is the particle's acceleration at  $t = 4.8$  second? Show the work that leads to your answer. Explain what this number means in terms of the particle's velocity.
- (f) On what open intervals or at what time(s)  $0 < t < 6$  acceleration of the particle the greatest? Justify.

The values of the coordinate  $s$  of a bug moving smoothly and continuously along a line for various values of  $t \in [0, 4]$  are given below.

|        |      |      |      |      |      |      |      |      |     |
|--------|------|------|------|------|------|------|------|------|-----|
| $t$    | 0    | 0.5  | 1    | 1.5  | 2    | 2.7  | 3    | 3.6  | 4   |
| $s(t)$ | 40.0 | 35.0 | 30.2 | 36.0 | 48.2 | 45.0 | 38.2 | 16.0 | 0.2 |

- (a) What is the displacement of the bug during the given interval  $t \in [0, 4]$ ? Show the work that leads to your answer.
- (b) What is the minimum number of times the bug changes directions for  $t \in [0, 4]$ ? Explain your reasoning.
- (c) What is the bug's average velocity for  $t \in [0, 0.5]$ ? Show the work that leads to your answer.

The values of the coordinate  $s$  of a bug moving smoothly and continuously along a line for various values of  $t \in [0, 4]$  are given below.

|        |      |      |      |      |      |      |      |      |     |
|--------|------|------|------|------|------|------|------|------|-----|
| $t$    | 0    | 0.5  | 1    | 1.5  | 2    | 2.7  | 3    | 3.6  | 4   |
| $s(t)$ | 40.0 | 35.0 | 30.2 | 36.0 | 48.2 | 45.0 | 38.2 | 16.0 | 0.2 |

(d) Estimate the bug's velocity at each of the following. Use proper notation (always), and show the work that leads to your answers.

(i) At  $t = 0.5$

(ii) At  $t = 2.7$

(iii) At  $t = 3.5$

(e) From the information given, is it possible to determine the time and position of the bug when it is farthest away from the origin? Why or why not?