3.4 Concepts Worksheet
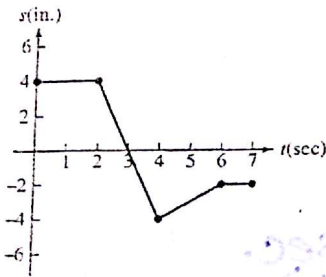
Velocity, Speed, and Acceleration

1. The graph shows the position $s(t)$ of a particle moving along a horizontal coordinate axis.

s(in.)

t(sec)
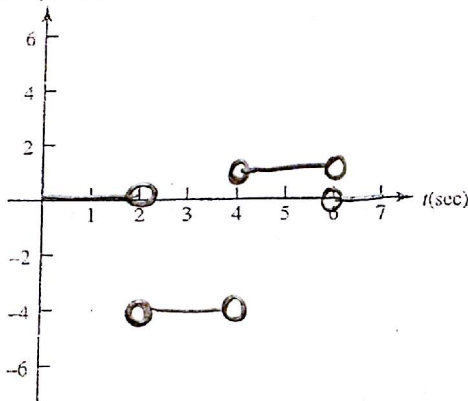
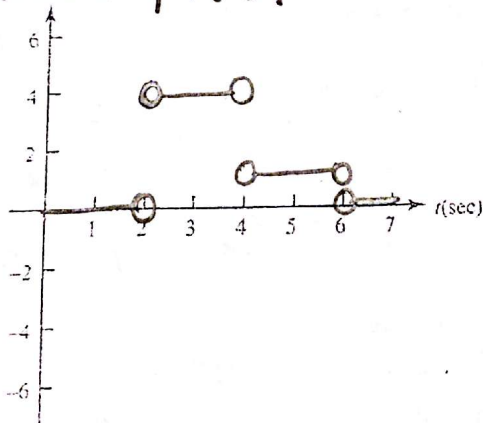*[handwritten:]* (2,4) (4,−4)

$\dfrac{8}{-2} = -4$

(4,−4) (6,−2)

$\dfrac{-2-(-4)}{6-4} = 1$

(a) When is the particle moving to the left? __(2,4)__ neg slope

(b) When is the particle moving to the right? __(4,6)__ pos slope

(c) When is the particle standing still? __(0,2) ∪ (6,7)__ constant slope

(d) Graph the particle's velocity and speed (where defined).

Velocity(in./sec)
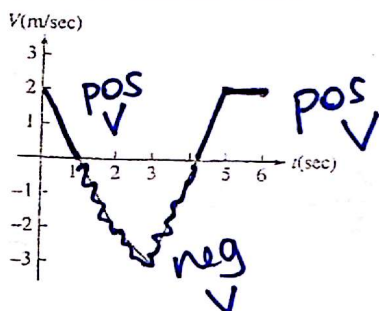
t(sec)

Speed(in./sec) $|v(t)|$

t(sec)

(e) When is the particle moving fastest? __(2,4)__

Scanned by CamScanner

2. The graph shows the velocity $v = f(t)$ of a particle moving along a horizontal coordinate axis.

V(m/sec)

[handwritten: POS V, POS V, neg V annotations on graph]

(a) When does the particle reverse direction? $t = 1, 4$ sec

(b) When is the particle moving at a constant speed? $(5, 6)$

(c) When is the particle moving at its greatest speed? $t = 3$

(d) Graph the acceleration (where defined). *[handwritten: biggest |y-value|]*

a(m/sec²)

[handwritten on right:]
$$v(t) = t^2 - 6t + 8 = 0$$
$$(t-4)(t-2) = 0$$
$$t = 4, 2$$
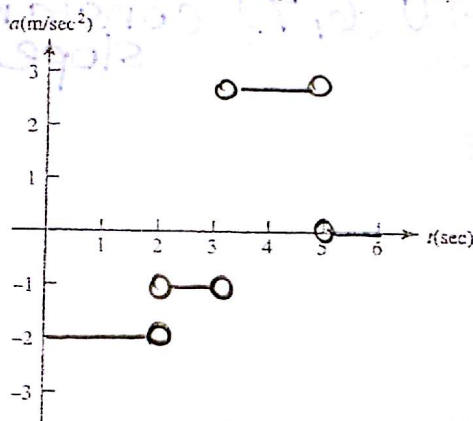
3. A particle moves along a vertical coordinate axis so that its position at any time $t \geq 0$ is given by the function $s(t) = \frac{1}{3}t^3 - 3t^2 + 8t - 4$, where s is measured in centimeters and t is measured in seconds.

t	$s(t)$
0	-4
2	$-40/3$
4	$4/3$
6	8

(a) Find the displacement during the first 6 seconds.
$$8 - (-4) = 12 \text{ cm}$$

(b) Find the average velocity during the first 6 seconds.
$$\frac{8-(-4)}{6-0} = \frac{12}{6} = 2 \text{ cm/sec}$$

(c) Find expressions for the velocity and acceleration at time t.
$v(t) =$ _____ $a(t) = 2t - 6$

(d) For what values of t is the particle moving downward?
$v(t)$ is neg
$(2, 4)$

[handwritten: v(t) sign chart]
$v(t)$
$\langle \frac{|+|-|+|}{0 \ 2 \ 4 \ 6} \rangle$ t

Scanned by CamScanner