Acceleration

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Acceleration is the instantaneous rate of change of velocity. It tells how quickly the body picks up or loses speed; how fast the velocity is changing.

$$a(t) = \frac{dv}{dt} = v'(t) = \frac{d^2 s}{dt^2} = s''(t)$$

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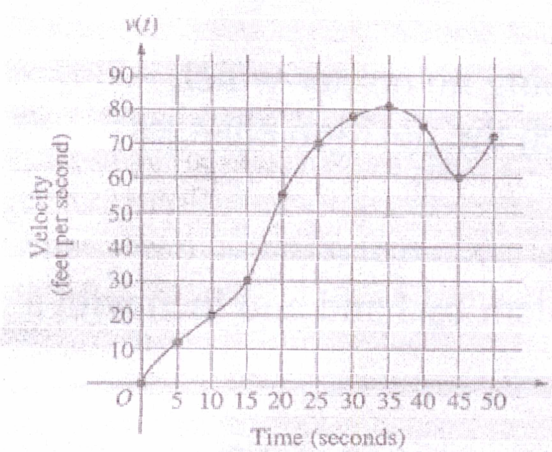

t (seconds)	v(t) (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \le t \le 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t, is also shown.

(a) During what intervals of time is the acceleration of the car positive? Give a reason for your answer.

$a(t) > 0$ when $v'(t) > 0$ $(0, 35)$ and $(45, 50)$

(b) Find the average acceleration of the car, in ft/sec^2, over the interval $0 \le t \le 50$.

$$\frac{V(50) - V(0)}{50 - 0} = \frac{72 - 0}{50 - 0} = \frac{72}{50}\ ft/s^2 = \frac{36}{25}\ ft/s^2$$

(c) Find one approximation for the acceleration of the car, in ft/sec^2, at $t = 40$. Show the computations you used to arrive at your answer.

$$a(40) = \frac{V(45) - V(35)}{45 - 35} = \frac{60 - 81}{10} = \frac{-21}{10} = -2.1\ ft/s^2$$

or $$\frac{V(40) - V(35)}{40 - 35} = \frac{75 - 81}{5} = \frac{-6}{5} = -1.2\ ft/s^2$$

or $$\frac{V(45) - V(40)}{45 - 40} = \frac{60 - 75}{5} = \frac{-15}{5} = -3\ ft/s^2$$