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.

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

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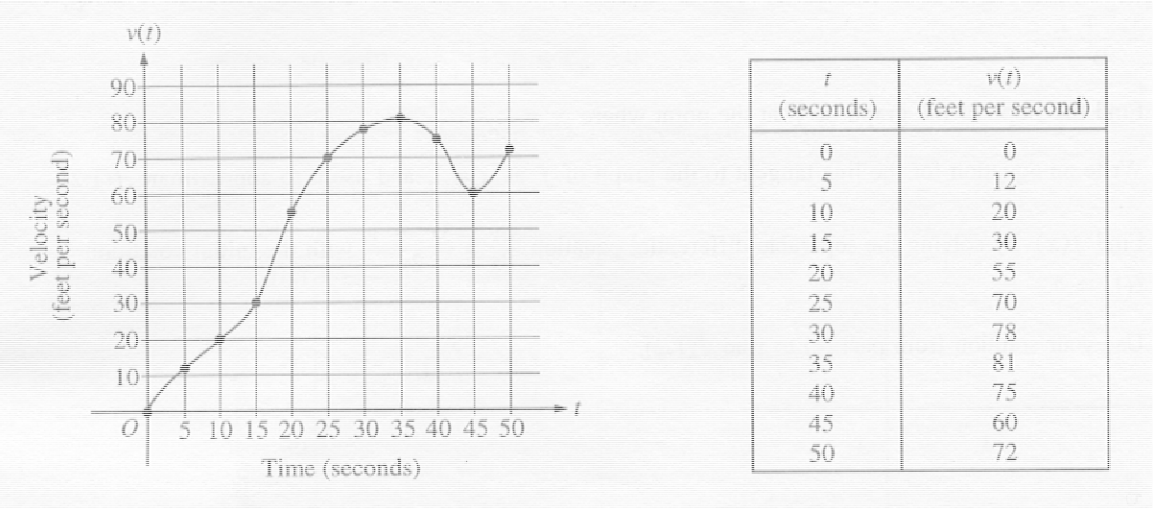

t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

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.

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

(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.

Notes on PVA

A particle moves along a line so that its position at any time $t \geq 0$ is given by $s(t) = t^2 - 4t + 3$, where s is measured in meters and t is measured in seconds.

a) Find the position of the particle at 2 seconds and interpret the meaning.

b) Find the average velocity of the particle during the first 4 seconds.

c) Find the instantaneous velocity of the particle when $t = 4$.

d) Find the acceleration of the particle when $t = 4$.

e) At what values of t does the particle change directions?

f) Use parametric graphing to view the motion of the particle on the horizontal line $y = 2$.