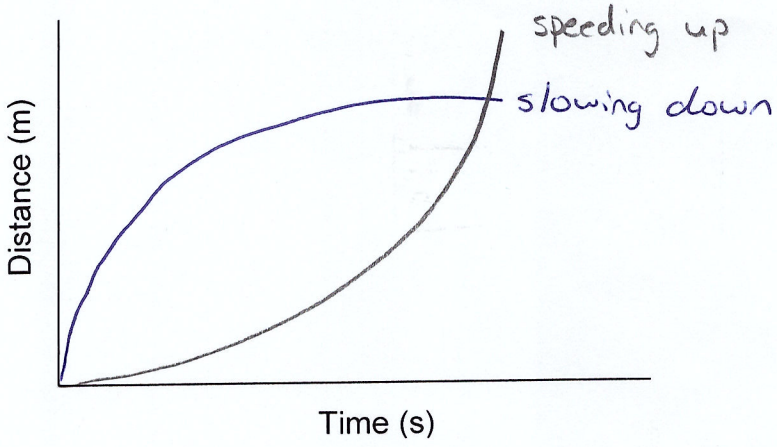
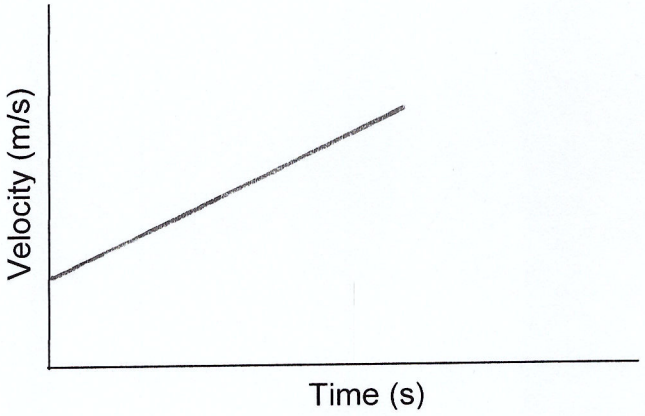
Uniform Accelerated Motion Graphs

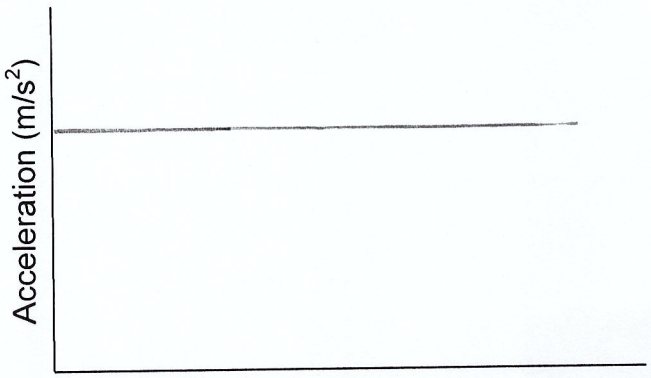
- Constant acceleration or uniform accelerated motion can be graphed in several ways





$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{\Delta \vec{v}}{\Delta t} = \vec{a}$!

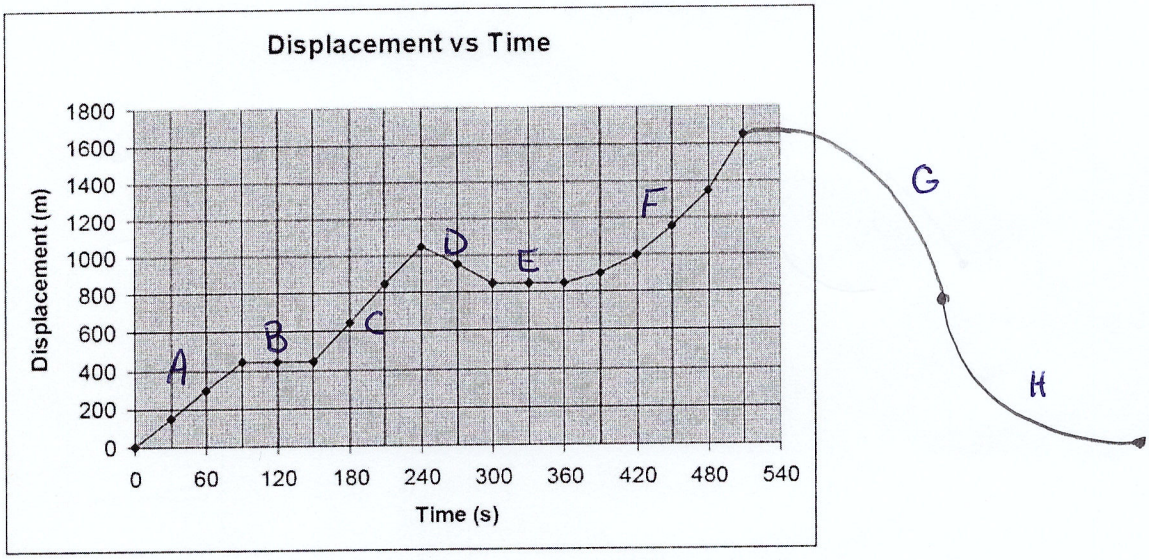
$\text{area} = lw$ or $\frac{lw}{2} = \vec{v}t = \vec{d}$!



$\text{area} = lw = \vec{a}t = \Delta\vec{v}$!

EXAMPLES

1. Describe the type of motion and the direction of each section of the following graph.



B & E: Object at rest

A & C: constant velocity in positive direction, but section C has faster speed

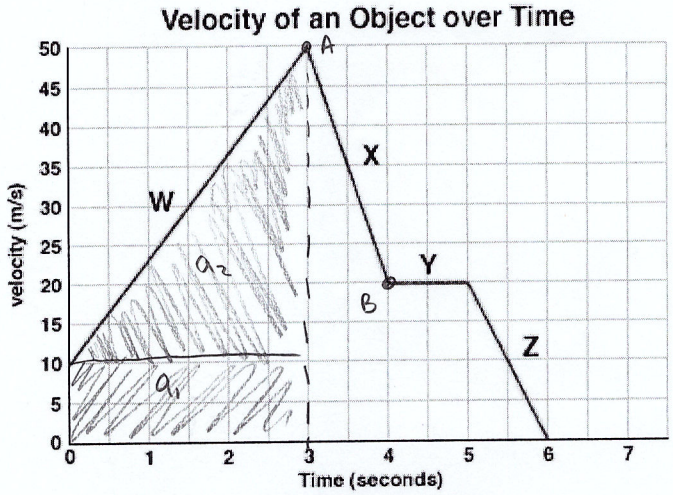
D: constant velocity in opposite direction

F: accelerating in positive direction

G: accelerating in opposite direction

H: decelerating in opposite direction

2. Use the following information to answer the next questions.



a. At what time(s) does the object come to a stop?

at 6s

b. Does the object change its direction of motion? If so, at what time?

no change in direction

c. At what time(s) does the object slow down?

sections X & Z ("-" acceleration)

d. At what time(s) is the object at constant velocity?

Section Y

e. Calculate the acceleration at 3.5s. → constant acceleration from 3 to 4 seconds

slope ↙ ↘ vector

Point A: (3, 50)
Point B: (4, 20

$$\text{slope} = \frac{(50-20)\,m/s}{(3-4)\,s} = \frac{30\,m/s}{-1s} = -30\,m/s^2$$

$\vec{a} = 30\,m/s^2$, opposite direction

f. What is the distance travelled during the first 3 seconds?

area ↙ → scalar

$\vec{d} = \text{area}_{\text{total}} = a_1 + a_2$

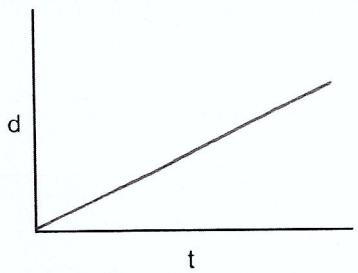
$\text{area} = (3)(10) + \frac{(3)(40)}{2} = 90_m$

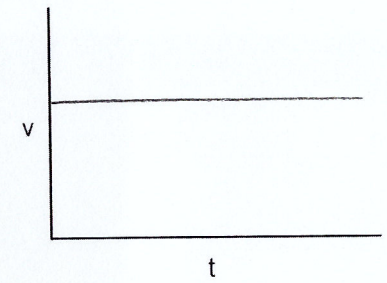
$\boxed{d = 90_m}$

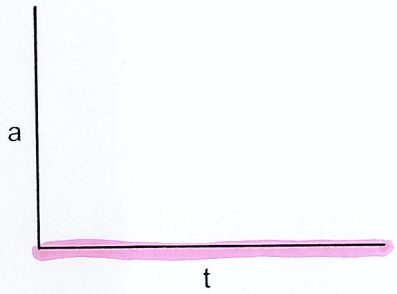
*****Now try pg. 49 #36, 37, 41, 44 (acceptable), 38, 43 (intermediate), 45 (excellence)*****

Review of All Graphs

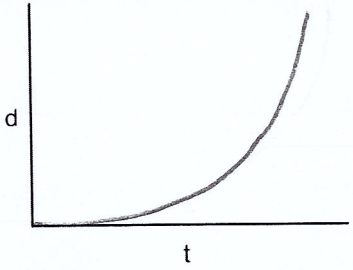
UNIFORM MOTION

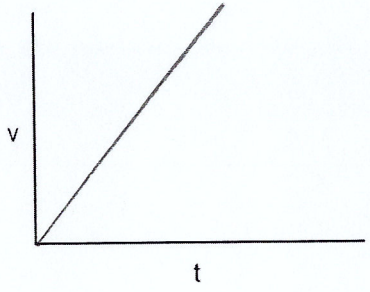


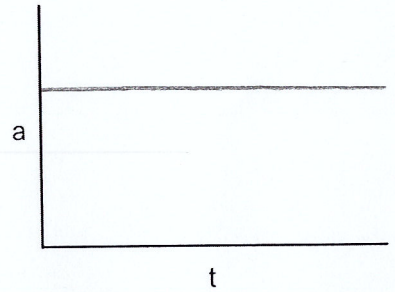




UNIFORM ACCELERATED MOTION







SLOPE

$\text{slope} = \frac{\Delta y}{\Delta x}$

$\text{slope} = \frac{\Delta d}{\Delta t} = v$

slope = v !

$\text{slope} = \frac{\Delta v}{\Delta t} = a$

slope = a !

AREA

area = lw or $\frac{lw}{2}$

~~area = dt~~

area = $\Delta v t = d$

area = d !

area = $a \Delta t = \Delta v$

area = Δv !