Ques1. A body thrown vertically upward and returns back to the thrower after 6 seconds. Find- 1.velocity with which the body is thrown. 2.distance and

displacement of the body after- (a) 1 sec (b) 2 sec (c) 3 sec (d) 4 sec (e) 5 sec (f) 6 sec 3. Using given data plot- (a) distance time graph (b) displacement time graph (c) speed time graph (d) velocity time graph (e) acceleration time graph 4. Can a body have zero velocity while moving with uniform acceleration. Explain with graph.

Solution

The vertical position of the body relatively to the thrower:

$$y = v_0 t - \frac{gt^2}{2}$$

When the body returns to the thrower, $t = 6$ and $y = 0$:

$6v_0 - 18g = 0$;

$v_0 = 3g$;

$v_0 = 29.4$ m/s

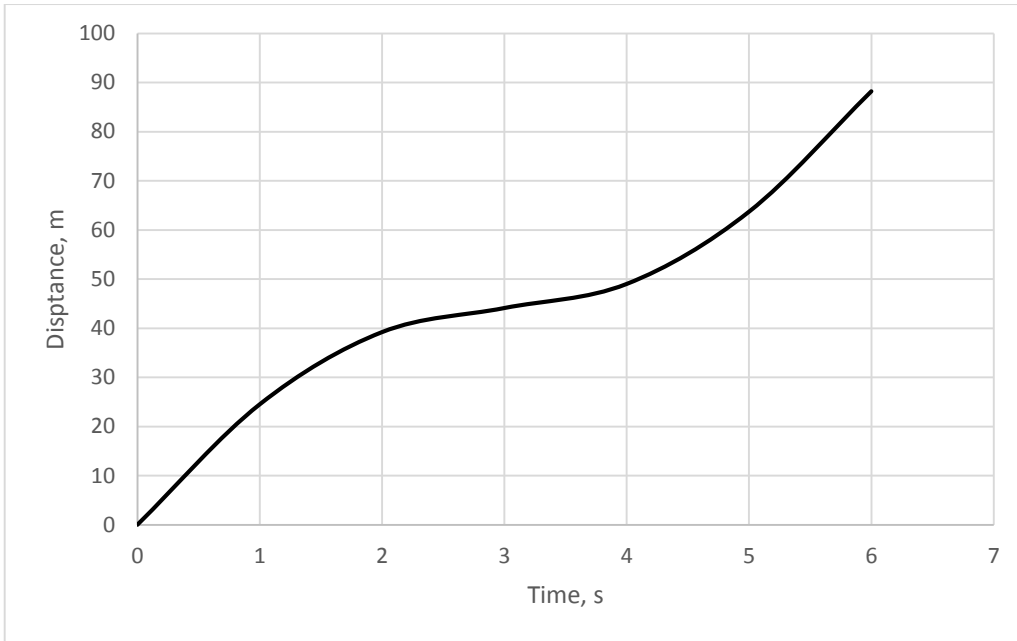Plugging the initial velocity into the original equation:

$y = 29.4t - 4.9t^2$

Plugging t values and calculating y:

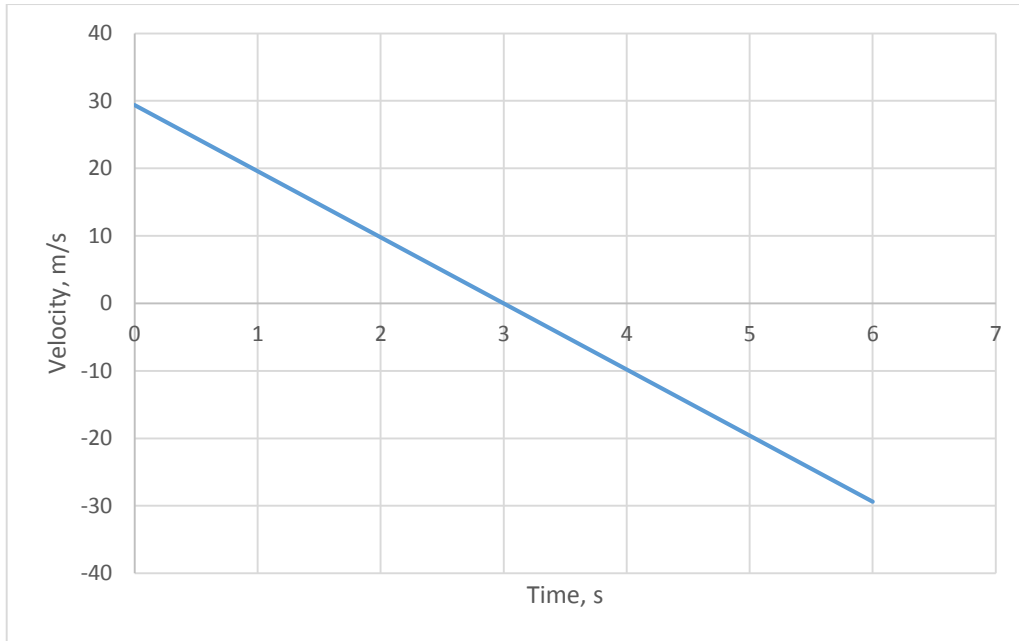| t	1	2	3	4	5	6
y	24.5	39.2	44.1	39.2	24.5	0

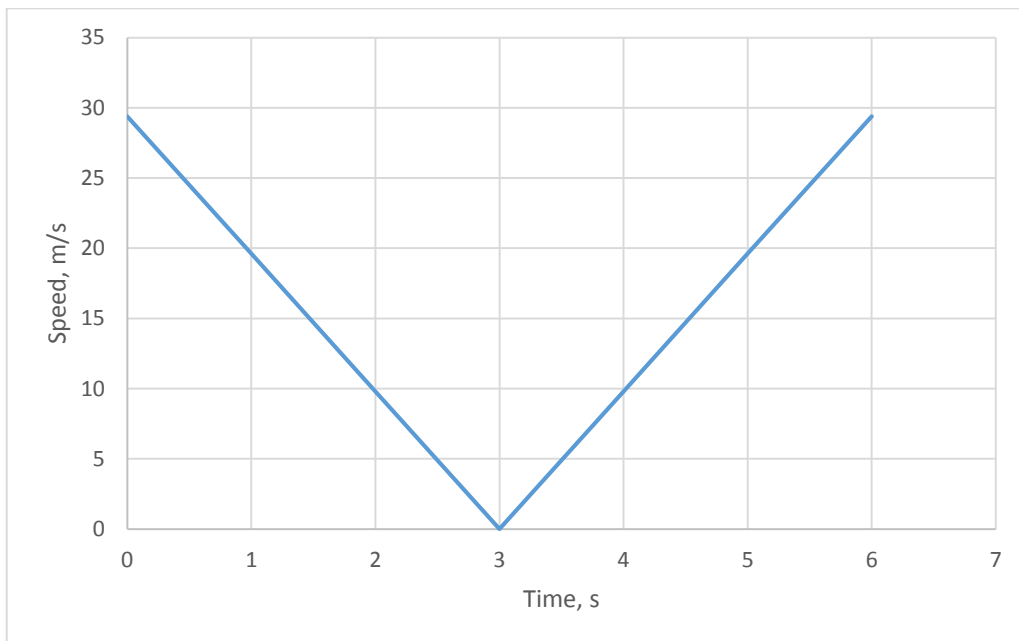Distance-time graph:

Displacement-time graph:

The velocity is the first derivative from displacement:
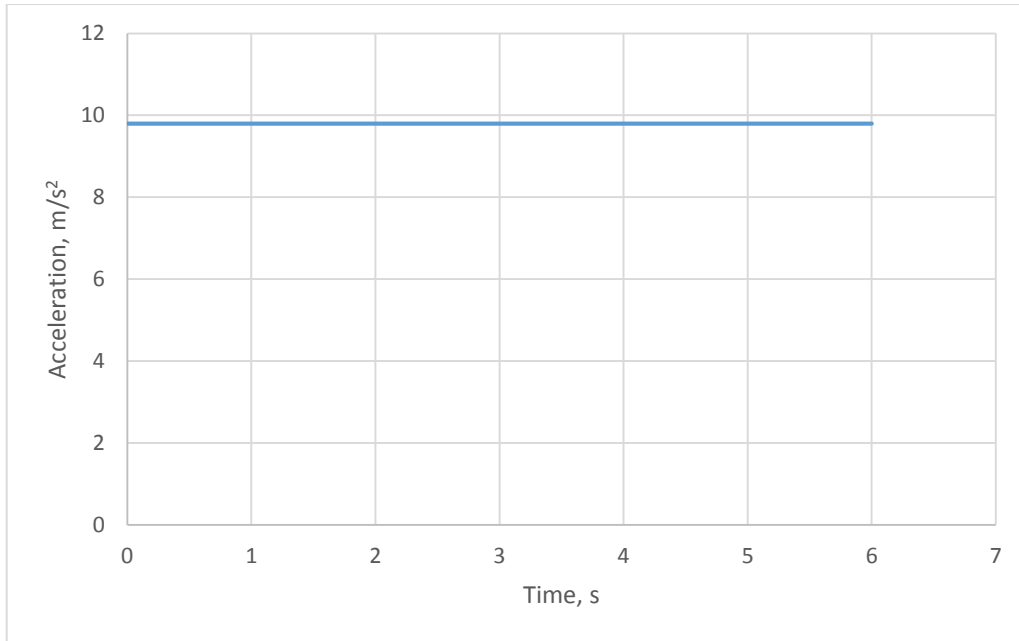
$$y' = 29.4 - 9.8t$$

Speed is the absolute value of the velocity:

$$y' = |29.4 - 9.8t|$$

The acceleration is the free fall acceleration: $a = g = 9.8$

The body has zero acceleration at the highest point ($t = 3$). At this point, the velocity-time graph crosses the x-axis.