

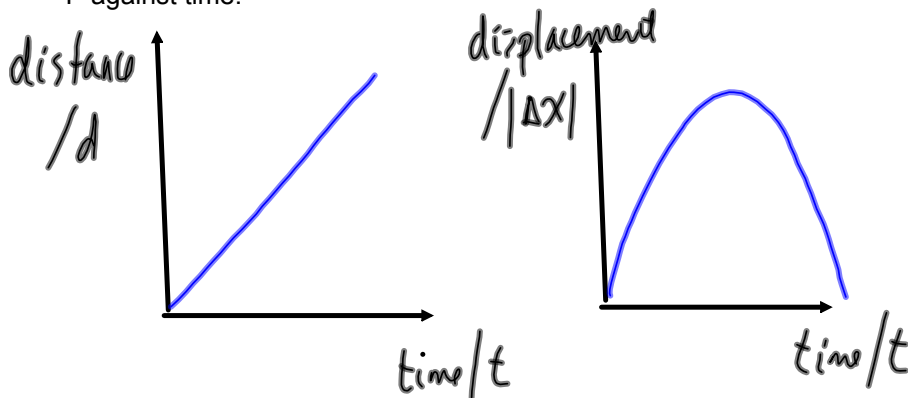
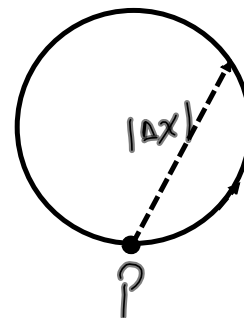
Displacement-time & distance-time graphs

Displacement-time and distance-time graphs are the same when the motion is all in the same direction, but are different when there is back & forth motion or the motion is in two dimensions

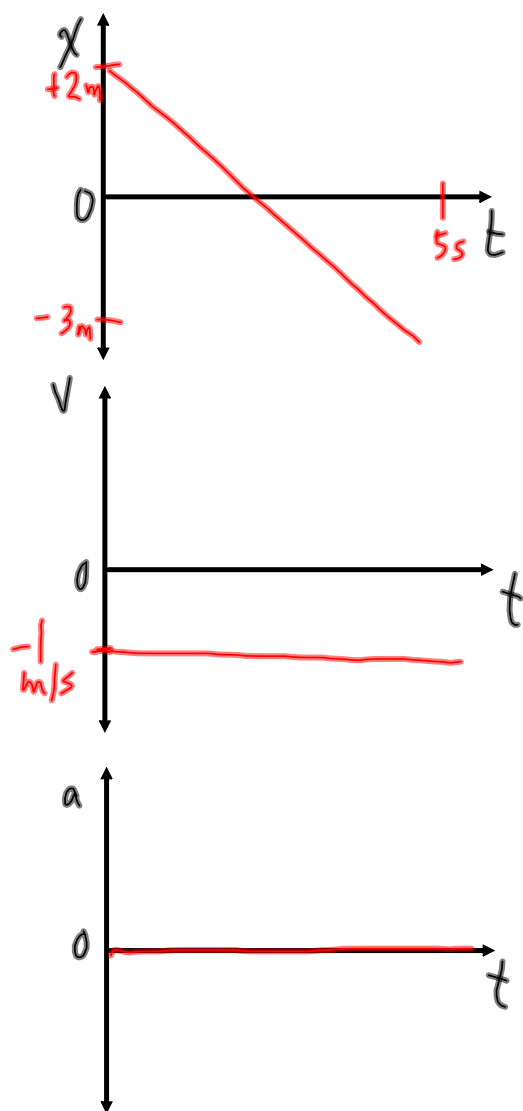
When drawing a displacement-time graph, only the magnitude of the displacement can be plotted.

Consider an track athlete who starts at P and runs with constant speed around a circular track, returning to point P.

Sketch graphs showing the distance she runs from P against time and the magnitude of the displacement from P against time.

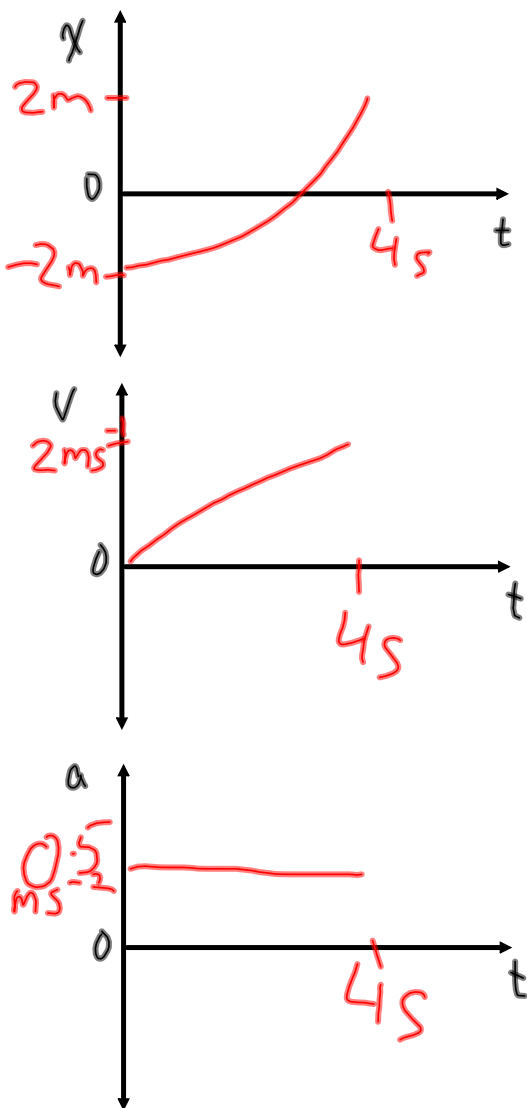


1. A ball moves with a constant velocity to the left, starting at +2 m from the origin and finishing at -3 m from the origin after 5 s



GRAPHS OF MOTION EXAMPLES

2. A ball starts from the origin and increase velocity horizontally to the right with a constant acceleration of 0.5 m s^{-2} for 4 s.



$$0.5(4) = 2 \text{ ms}^{-1}$$

$$\frac{2(4)}{2} = 4$$

$$v = \cancel{0} + at$$

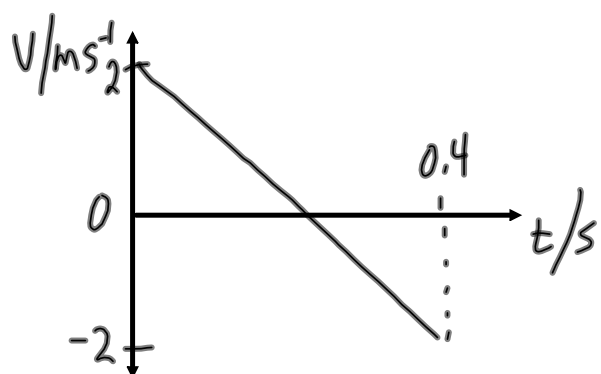
$$v = (0.5 \text{ ms}^{-2})(4 \text{ s}) = 2 \text{ ms}^{-1}$$

$$s = \cancel{0}t + \frac{1}{2}at^2$$

$$s = \frac{1}{2}(0.5 \text{ ms}^{-2})(4 \text{ s})^2$$

$$s = 4 \text{ m}$$

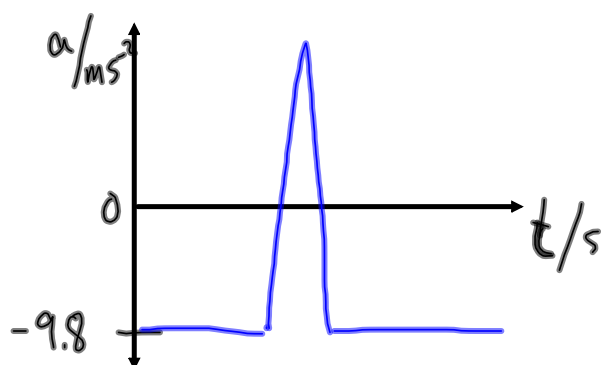
3. Write descriptions of motion represented by the following graphs and give an example in each case where such motion might occur.



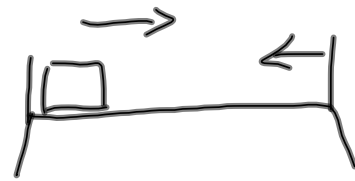
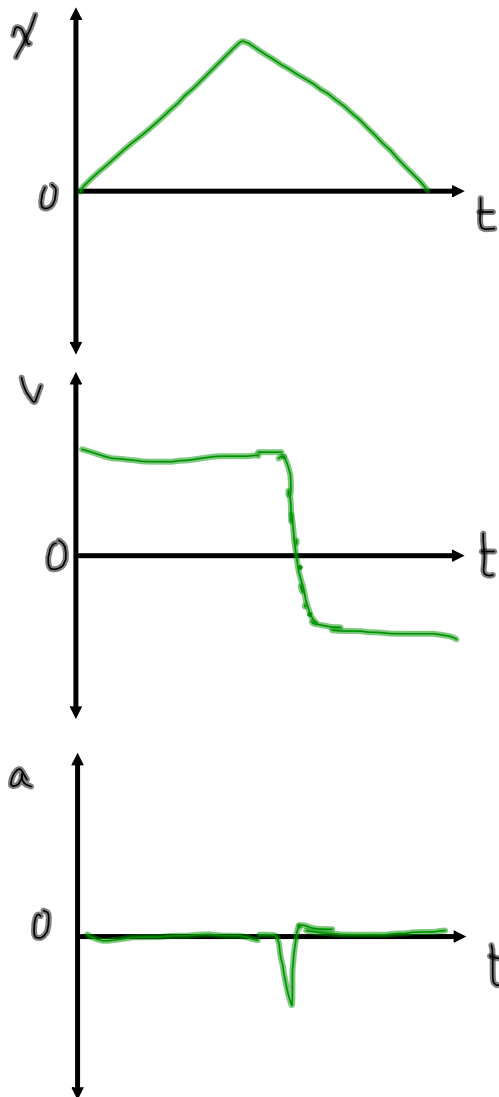
$$a = \frac{-2 \text{ms}^{-1} - 2 \text{ms}^{-1}}{0.4 \text{s}}$$

$$a = \frac{-4 \text{ms}^{-1}}{0.4 \text{s}}$$

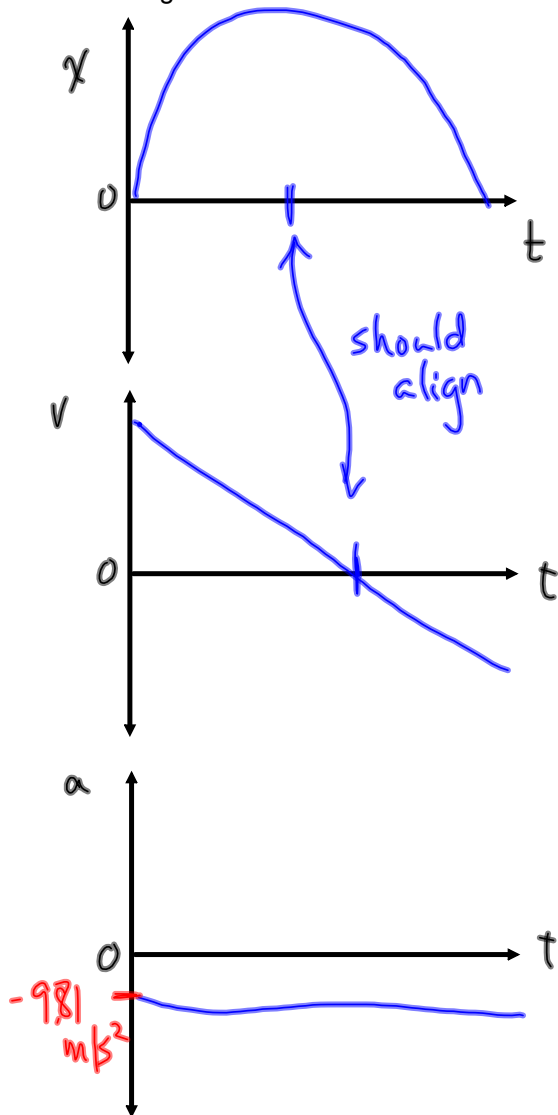
$$a = -10 \text{ms}^{-2}$$



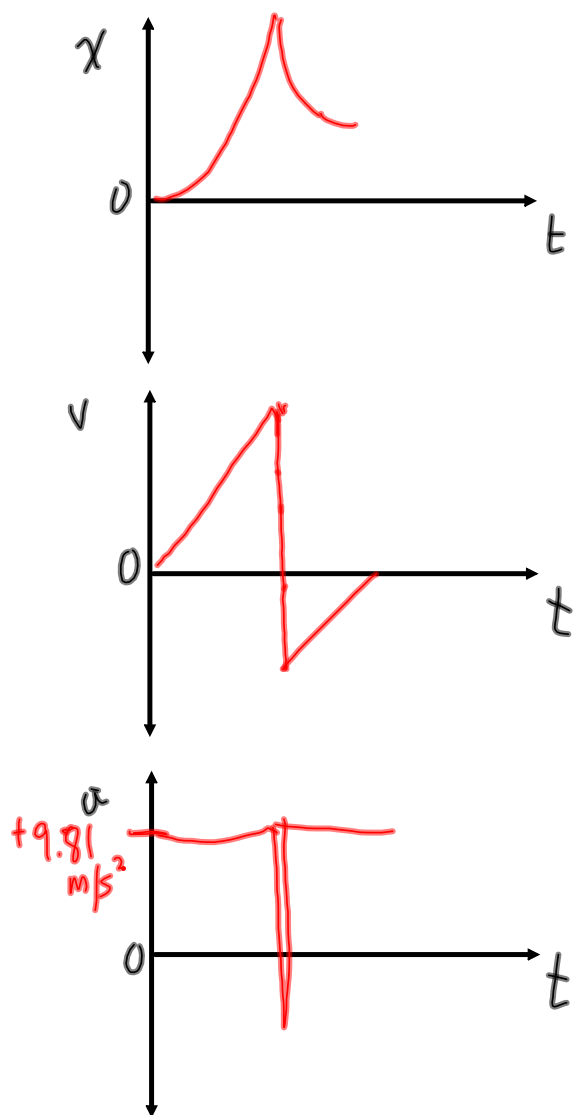
4. Sketch the graphs for a glider on a frictionless, horizontal linear air track. The glider leaves from the left hand end, travels the length of the track and bounces from the right hand end, returning at the same speed. Take the zero of position to be the left hand end, and right to be the positive direction.



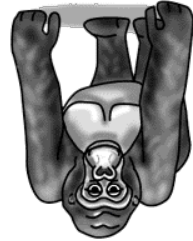
5. Sketch the graphs for a ball which is thrown vertically up from a person's hand, and which then falls back down to its starting position. Take the zero of position to be where is left the hand and up to be the positive direction. Neglect air resistance.



6. Sketch the graphs for a ball which is dropped from a cliff, bounces on the ground below and then returns to a lower height. Take the zero of position to be the top of the cliff and down to be the positive direction. Neglect air resistance.



Relative Motion +
Frames of Reference



Who is upside down?

Depends on the
observer

