

Rectilinear Motion

$s(t)$ position

$s'(t) = v(t)$ vel.

$v'(t) = a(t)$ accel

$v(t) > 0$ right/up

$v(t) < 0$ left/down

$v(t) = 0$ rest

$v(t)$ changes sign –
change in direct.

gravity problem

Max ht

$$V(t) = 0 \rightarrow t = \star$$

$$S(\star) = \max ht$$

Vel at impact

$$S(t) = 0 \rightarrow t = \Delta$$

$$V(\Delta) = \text{vel at impact}$$

$$\text{speed} = |v|$$

• $v > 0$ $a > 0$ $\text{vel} \uparrow$ $\text{speed} \uparrow$

$v > 0$ $a < 0$ $\text{vel} \downarrow$ $\text{speed} \downarrow$

$v < 0$ $a > 0$ $\text{vel} \uparrow$ $\text{speed} \downarrow$

• $v < 0$ $a < 0$ $\text{vel} \downarrow$ $\text{speed} \uparrow$

$$S(t) = 2t^3 - 4t^2 + 2t - 1 \text{ for } t \geq 0.$$

$$V(t) = 6t^2 - 8t + 2$$

$$V(t) = 0 \rightarrow t = \frac{1}{3} \text{ or } t = 1$$

Part moving right on $(-\infty, \frac{1}{3}) \cup (1, \infty)$
because $V(t) > 0$ on $(-\infty, \frac{1}{3}) \cup (1, \infty)$.

Part moving left on $(\frac{1}{3}, 1)$ because $V(t) < 0$ on $(\frac{1}{3}, 1)$.

Pot changes direct at $t = \frac{1}{3}$ because

$V(t) > 0$ on $(-\infty, \frac{1}{3})$ and $V(t) < 0$ on $(\frac{1}{3}, \infty)$.

Pot changes dir. at $t = 1$ because

$V(t) < 0$ on $(\frac{1}{3}, 1)$ and $V(t) > 0$ on $(1, \infty)$.

$$s(t) = -16t^2 + 64t + 100$$

$$v(t) = -32t + 64$$

Max Lt

$$v(t) = 0 \rightarrow t = 2$$

$$s(2) = 164$$

$\therefore$ max Lt is 164 feet



Vel hits gnd

$$s(t) = 0 \rightarrow t = -1.202 \text{ or } t = 5.202$$

$$v(5.202) = -102.450$$

$\therefore$ vel at ground is 102.450 ft/sec downward