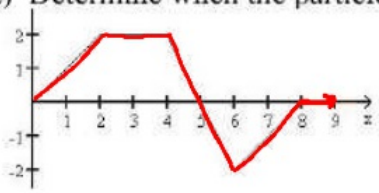
In each situation below, the graph given is the graph of the velocity function

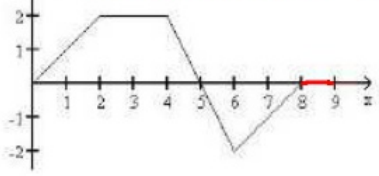
a) Determine when the particle is moving forward and moving backward



$v(t) > 0$ above x-axis $(0,5)$

$v(t) < 0$ below x-axis $(5,8)$

b) Determine when the acceleration of the particle is positive, negative, and zero. $(v'(t) = 0) \rightarrow (2,4) \cup (8,9)$



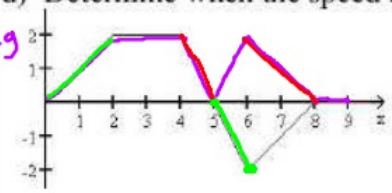
pos slope: $a(t) > 0$, $v'(t) > 0$ $(0,2)$ $(6,8)$

neg slope: $a(t) < 0$, $v'(t) < 0$ $(4,6)$


c) Determine when the particle is at its greatest speed.

$[2,4]$ and $t = 6$

d) Determine when the speed is increasing. $|v(t)|$ pos slope

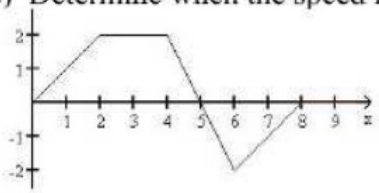


$(0,2) \cup (5,6)$

away from x-axis

| | |
|---|---|
| $v(t) > 0$ | $a(t) > 0$ |
| $v(t) < 0$ | $a(t) < 0$ |

e) Determine when the speed is decreasing.

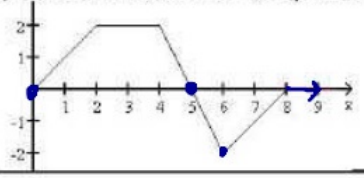


$(4,5) \cup (6,8)$

toward x-axis

speed decreasing when $v(t)$ and $a(t)$ have opp signs

f) Determine when the particle is standing still.



$v(t) = 0$

$t = 0, 5.$

$(8,9)$

speed increasing when $v(t)$ and $a(t)$ have the same sign

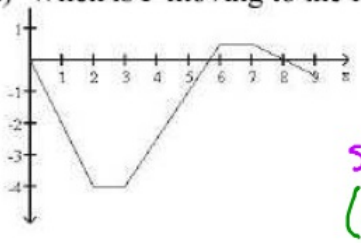
$t = 6$

$v(t) < 0$

$a(t)$ is undefined

In each situation below, the graph given is the graph of the position function

a) When is P moving to the left, to the right and standing still?

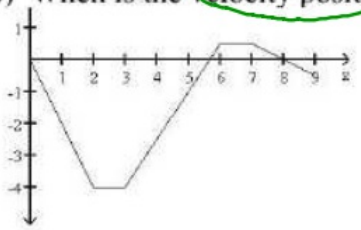


$s'(t) < 0$ slope of $s(t)$ $(0,2) \cup (7,9)$

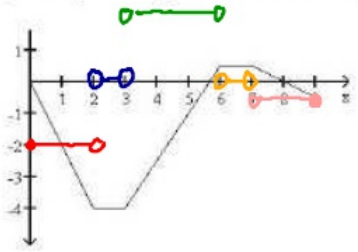
$s'(t) > 0$ $(3,6)$

$s'(t) = 0$ $(2,3) \cup (6,7)$

b) When is the velocity positive, negative and zero



c) Graph the particles velocity



$[0,2)$ $v(t) = -2$

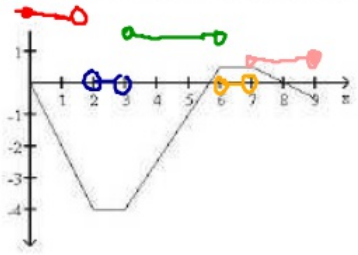
$(2,3)$ $v(t) = 0$

$(3,6)$ $v(t) = 1.5$

$(6,7)$ $v(t) = 0$

$(7,9]$ $v(t) = -\frac{1}{2}$

d) Graph the particles speed



Particle Motion Summary Given the **Velocity v(t)** graph

| Determine when the particle | Justify/Explain/Give a reason | Where to look on the velocity graph |
|---|---|---|
| Forward/Up/Right | $v(t) > 0$ | Above the x-axis |
| Backward/Down/Left | $v(t) < 0$ | Below the x-axis |
| Stopped/At rest | $v(t) = 0$ | Touches x-axis |
| Changes Direction | $v(t) = 0$ and $v(t)$ changes sign | Crosses x-axis |
| Acceleration Positive | $v'(t) > 0$ | Positive slope/Increasing |
| Acceleration Negative | $v'(t) < 0$ | Negative slope/Decreasing |
| Acceleration Zero | $v'(t) = 0$ | Zero slope/Constant |
| Acceleration Undefined | $v'(t)$ undefined | Corners/Cusps/Vertical Tangents |
| Speed increasing Speeding up | $v(t)$ and $a(t)$ have the same sign | Graph moving away from the x-axis |
| Speed decreasing | $v(t)$ and $a(t)$ have opposite signs | Graph moving toward the x-axis |
| Greatest Speed | $\lvert v(t) \rvert$ is the greatest | When graph is furthest away from the x-axis in either direction |