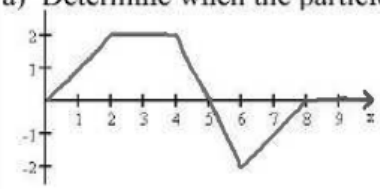
In each situation below, the graph given is the graph of the velocity function

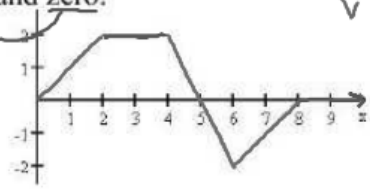
a) Determine when the particle is moving forward and moving backward



$v(t) > 0$ 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.



$v'(t) = 0$ slope zero $v(t)$ constant $(2,4) \cup (8,\infty)$

$v'(t) > 0$ slope pos $v(t)$ going up $(0,2) \cup (6,8)$

$v'(t) < 0$ slope neg $v(t)$ going down $(4,6)$

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

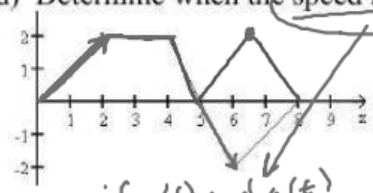
Max of the speed graph OR Farthest from x-axis on $v(t)$ graph

$(2,4) \cup t = 6$ $\quad 2 < x < 4$ and $t = 6$

d) Determine when the speed is increasing.

speed up

speed $= |v(t)|$



speed graph going up $(0,2) \cup (5,6)$

$\boxed{v(t) > 0 \quad a(t) > 0}$

$\boxed{v(t) < 0 \quad a(t) < 0}$

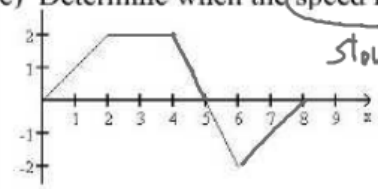
if $v(t)$ and $a(t)$ have the same sign

e) Determine when the speed is decreasing.

slow down

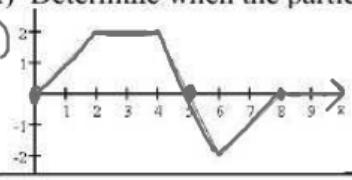
when $a(t)$ and $v(t)$ opp signs

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



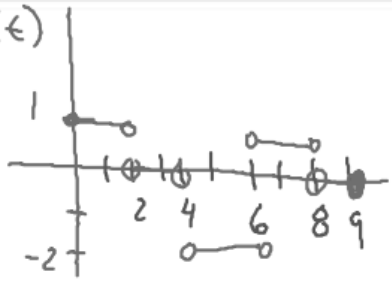
f) Determine when the particle is standing still

$v(t) = 0$



Find x-int $\quad x = 0 \quad x = 5 \quad x \geq 8$

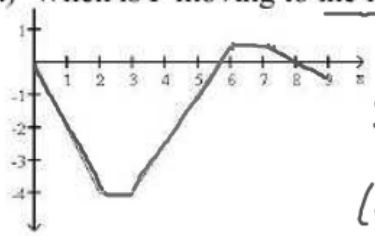
Graph $a(t)$



s(t)

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?

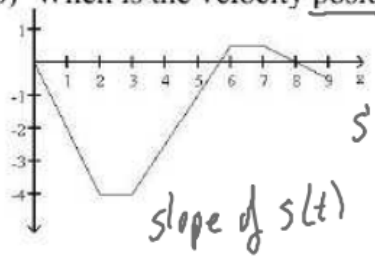


graph is moving down
$s'(t) < 0$
$(0,2) \cup (7,9)$

graph going up
$s'(t) > 0$
$(3,6)$

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

b) When is the velocity positive, negative, and zero



$s'(t) > 0$

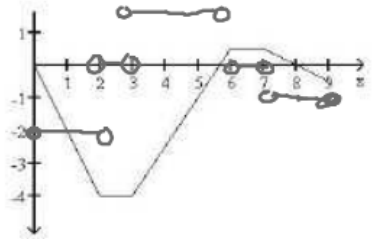
$s'(t) < 0$

$s'(t) = 0$

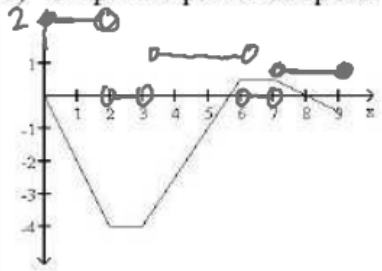
slope of $s(t)$

c) Graph the particles velocity

slope from $(0,2)$
$(2,3)$
$(3,6)$
$(6,7)$
$(7,9)$



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 slowdown	$v(t)$ 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