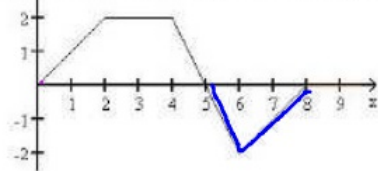In each situation below, the graph given is the graph of the velocity function

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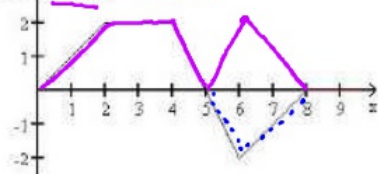

$v(t) > 0$
above x-axis
$(0, 5)$

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

$a(t) = 0$ when
slope $v(t) = 0$

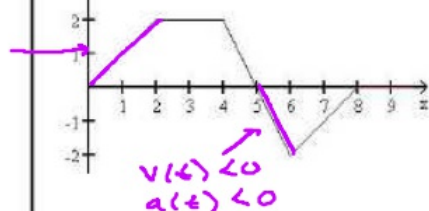b) Determine when the acceleration of the particle is positive, negative, and zero. $(2, 4)$

slope of $v(t) > 0$
($v(t)$ increasing)
$(0, 2) \cup (6, 8)$

slope of $v(t) < 0$
$v(t)$ dec
$(4, 6)$

greatest speed = 2

c) Determine when the particle is at its greatest speed.
Greatest distance from the x-axis in either direction
$(2, 4)$ and $t = 6$
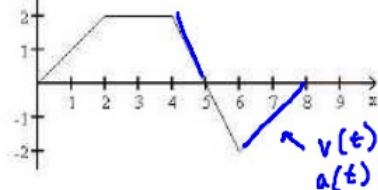
d) Determine when the speed is increasing. moving away from x-axis
$(0, 2) \cup (5, 6)$

$v(t) > 0$
$a(t) > 0$

$v(t) < 0$
$a(t) < 0$

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

e) Determine when the speed is decreasing. moving toward x-axis
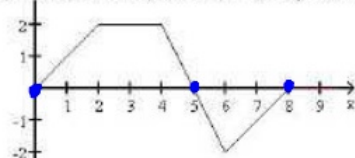$(4, 5) \cup (6, 8)$
because $v(t)$ and $a(t)$
opposite signs

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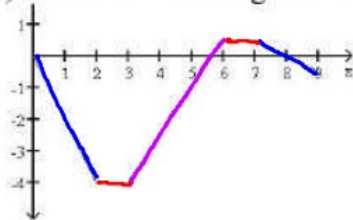$a(t) > 0$

f) Determine when the particle is standing still.
$v(t) = 0$ (x-intercepts)
$t = 0, 5, 8$

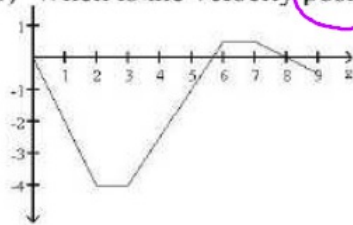In each situation below, the graph given is the graph of the position function

$v(t)=0$ / $s(t)$ constant

a) When is P moving to the left, to the right, and standing still? $(2,3) \cup (6,7)$
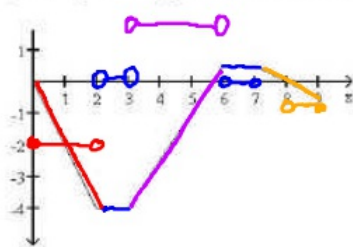

$v(t)<0$
$s(t)$ decreasing
$(0,2) \cup (7,9)$

$v(t)>0$
$s(t)$ increasing
$(3,6)$

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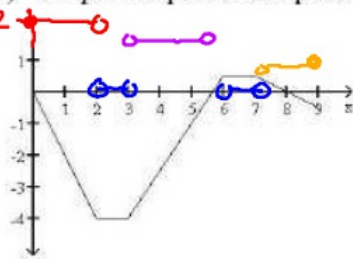

c) Graph the particles velocity

$(0,2)$ $v(t)=-2$
$(2,3)$ $v(t)=0$
$(3,6)$ $v(t)=1.5$
$(6,7)$ $v(t)=0$
$(7,9)$ $v(t)=\frac{1}{2}$

Speed $= v(t)$

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