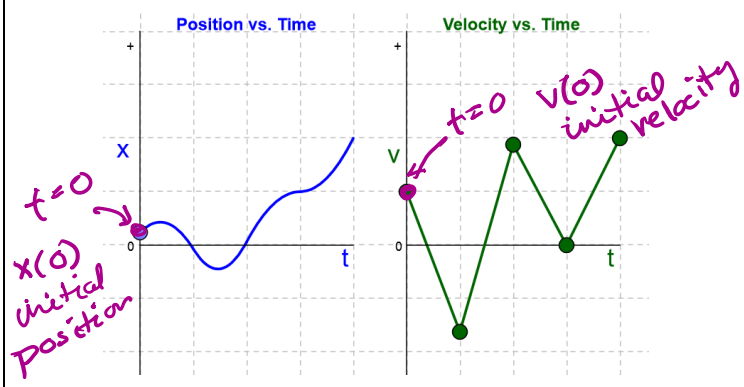
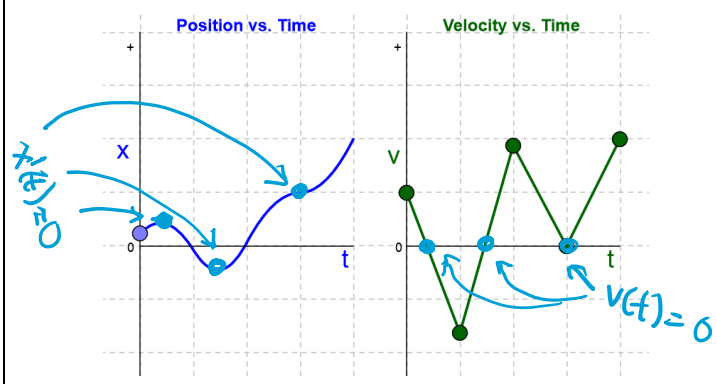
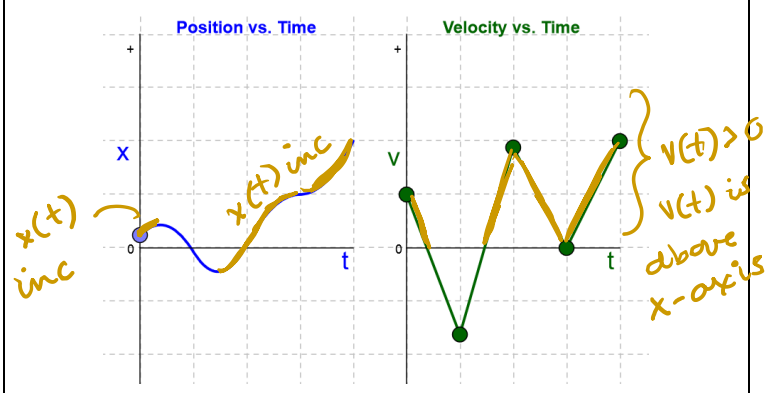
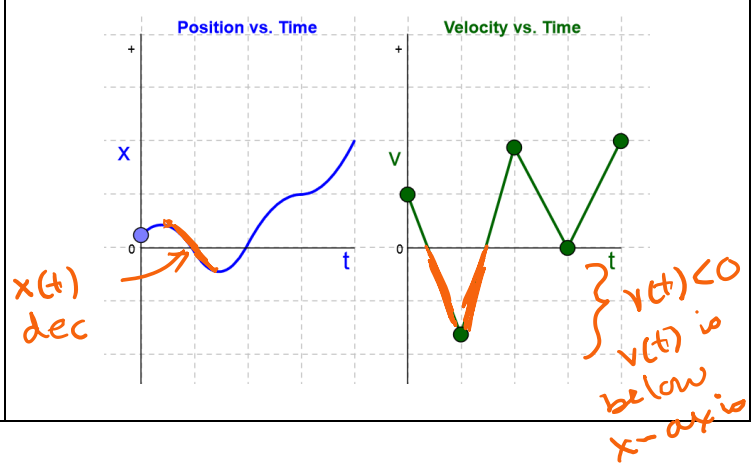
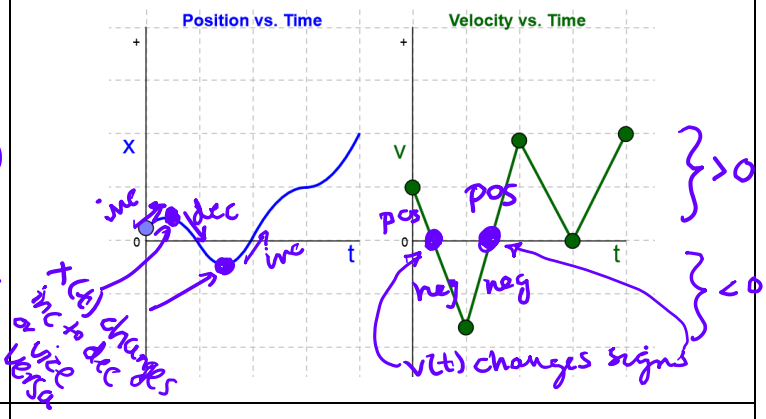
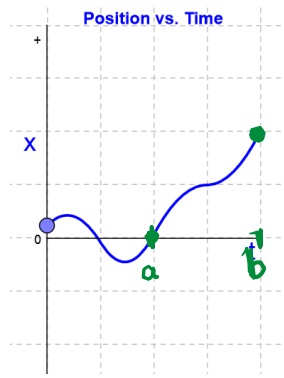
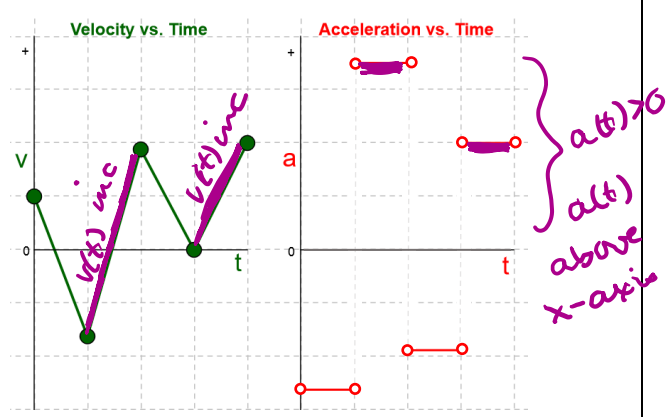
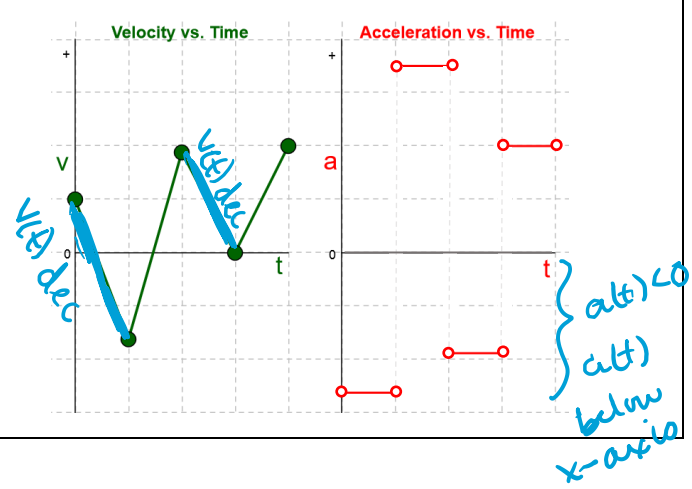
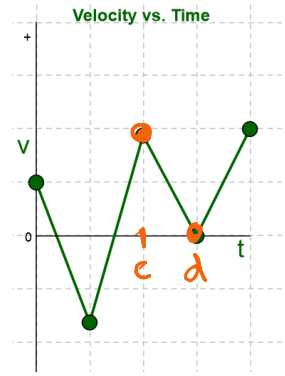
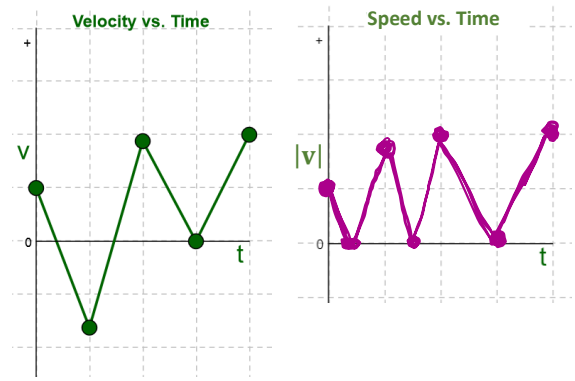
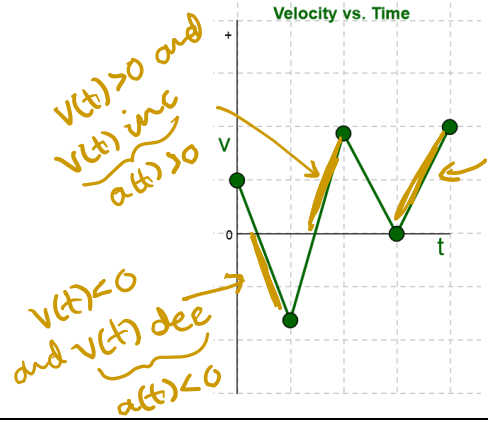
DATE: _____

Particle Motion (along *x*-axis or *y*-axis)

When you read…	Think…	See…
Initially	$t=0$	
Particle is at rest OR Particle is not moving	$v(t)=0$ $x'(t)=0$ slope of tangent lines on $x(t)$ are zero	
Particle is moving right (forward)	$v(t)>0$ $x'(t)>0$ $x(t)$ inc	
Particle is moving left (backward)	$v(t)<0$ $x'(t)<0$ $x(t)$ dec	

When you read…	Think…	See…
Particle changes direction	v(t) changes signs (pos to neg or neg to pos) x'(t) change signs or x(t) changes from inc to dec or dec to inc	
Velocity at $t = a$	$v(a) = x'(a)$	
Average Velocity on $[a, b]$	$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x(b) - x(a)}{b - a}$	on [2,4] $v_{avg} = \frac{2-0}{4-2} = \frac{1}{2}$ 
Velocity is increasing	$v'(t) > 0$ $a(t) > 0$	
Velocity is decreasing	$v'(t) < 0$ $a(t) < 0$	

When you read…	Think…	See…
Acceleration at $t = c$	$a(c) = v'(c)$	
Average acceleration on $[c, d]$	$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v(d) - v(c)}{d - c}$	on $[2,3]$ $a_{avg} = \frac{0-2}{3-2} = -2$ 
Speed	$\lvert v(t) \rvert$ magnitude of velocity → length	
Speed is increasing (particle is speeding up)	v(t) and a(t) have same signs. v(t) > 0 and a(t) > 0 or v(t) < 0 and a(t) < 0 OR v(t) > 0 and v(t) inc or v(t) < 0 and v(t) dec	
Speed is decreasing (particle is slowing down)	v(t) and a(t) have different signs v(t) > 0 and a(t) < 0 or v(t) < 0 and a(t) > 0 OR v(t) > 0 and v(t) dec or v(t) < 0 and v(t) inc