

Example: particle is moving along the x-axis. ($t \geq 0$)

$$v(t) = e^t (t^2 - 4)$$

particle moves to
if $v > 0 \rightarrow$ right

$v < 0 \rightarrow$ left

$v = 0 \rightarrow$ reverses direction.

For what values of t , particle is moving to the right?

$$v(t) = e^t (t+2)(t-2) \quad \text{Factor completely.}$$

$$v(t) = 0 = e^t (t+2)(t-2) \quad \text{Set equal to zero. Find zeros.}$$

~~at~~ $t=2$; $t \neq -2$ since $t \geq 0$.

	<u>Sign table</u>	0		2	
e^t		+		+	
$(t+2)$		+		+	
$(t-2)$		-		+	
$v(t) \rightarrow$		-		+	

so $0 < t < 2 \rightarrow v < 0 \rightarrow$ particle moves to the left.
 $2 < t \rightarrow v > 0 \rightarrow$ particle moves to the right.
 $t = 2 \rightarrow$ particle reverses direction.

~~1.9~~
1. A particle starts at time $t=0$ and moves along the x -axis so that its position at any time $t \geq 0$ is given by $x(t) = (t-1)^3(2t-3)$.

- (a) Find the velocity of the particle at any time $t \geq 0$.
- (b) For what values of t is the velocity of the particle less than zero?
- (c) Find the value of t when the particle is moving and the acceleration is zero.

2. A particle moves along the y -axis so that its velocity at any time $t \geq 0$ is given by $v(t) = t \cos t$. At time $t=0$, the position of the particle is $y=3$.

- (a) For what values of t , $0 \leq t \leq 5$, is the particle moving upward?
- (b) Write an expression for the acceleration of the particle in terms of t .

3. A particle moves on the x -axis so that its position at any time $t \geq 0$ is given by $x(t) = 2te^{-t}$.

- (a) Find the acceleration of the particle at $t=0$.
- (b) Find the velocity of the particle when its acceleration is 0.
- (c) Find the total distance traveled by the particle from $t=0$ to $t=5$.

For what values of t , the particle is going to the left?