

Yo, who's doing this paper? Key

AP Calculus AB: 5.5 Speeding up or Slowing Down

1) A particle travels along the x-axis and its position is given by the function

$$s(t) = (t^2 - 4)^3$$

a) Find when the particle comes to rest.

$$v(t) = 0$$

$$v(t) = 3(t^2 - 4)^2 \cdot 2t$$

$$= 6t(t^2 - 4)^2$$

$$6t = 0 \quad (t^2 - 4)^2 = 0$$

$$t = 0 \quad t^2 = 4$$

$$t = \pm 2$$

b) When does the particle change direction?



$$v(-2) = (-)(+) = -$$

$$v(-1) = (-)(+) = -$$

$$v(1) = (+)(+) = +$$

$$v(2) = (+)(+) = +$$

$t = 0$ because $v(t)$ changed signs

c) Is the particle speeding up or slowing down at $t = -1$?

$$v(-1) = -$$

$$a(-1) = -$$

Speeding up because $v(-1)$ and $a(-1)$ are negative

$$a(t) = (t^2 - 4)^2(6) + 6t(2)(t^2 - 4) \cdot 2t = 6(t^2 - 4) [4t^2 + 16t^2]$$

$$= 6(t^2 - 4)(4t^4 + 16t^2)$$

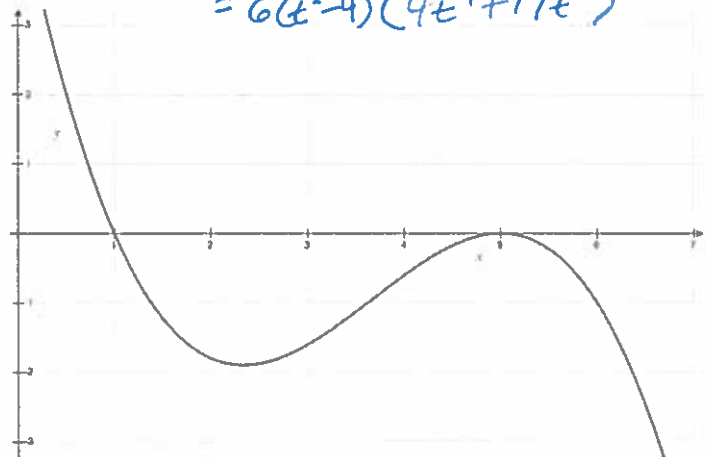
2) The graph to the right represents the velocity of a particle for the interval $0 \leq t \leq 7$.

a) When is the particle moving to the left? Justify.

$[1, 7]$ because $v(t)$ is negative

b) When does the particle change directions? Justify.

$t = 1$ because $v(t)$ changes signs.



c) When does the particle come to rest? Justify

$t = 1$ & 5 because $v(t) = 0$

d) When does the particle have a negative acceleration? Justify.

$(0, 2.25)$ $(5, 7)$ because $v(t)$ is decreasing

e) Is the particle speeding up or slowing down at $t = 4$? Justify.

$v(4) = -$
 $a(4) = +$
 slowing down because $v(4)$ and $a(4)$ are different signs

f) Is the particle speeding up or slowing down at $t = 2$? Justify.

$v(2) = -$
 $a(2) = -$
 speeding up because $v(2)$ and $a(2)$ are both negative