Hi, my name is Key

AP Calculus AB: 5.4 Intervals of Direction

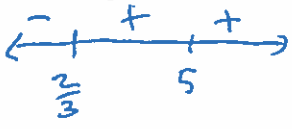
1. A particles velocity is given by the function $v(t) = (3t-2)(t-5)^2$ where velocity is measured in m/s and time is measured in seconds for the interval $0 \le t \le 9$.

a) Find the interval(s) where the particle is traveling to the left.

$v(t)=0$

$3t-2=0 \quad (t-5)^2=0$

$t=\frac{2}{3} \quad t=5$



$v(0)=(-)(+)=-$

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

$v(10)=(+)(+)=+$

$[0, \frac{2}{3}]$ because $v(t)$ is negative

b) Find when the particle changes direction.

$t=\frac{2}{3}$ because $v(t)$ changes signs

c) Find when $a(t) = 0$

$v'(t)=a(t)=(t-5)^2(3)+(3t-2)2(t-5)^1(1)=(t-5)[3t-15+6t-4]$

$=t-5[9t-19]$

$a(t)=0$

$t-5=0 \quad 9t-19=0$

$t=5 \quad t=\frac{19}{9}$

d) Find the average acceleration of the particle from t=0 to t=3.

$\frac{v(3)-v(0)}{3-0}=\frac{28+90}{3}=\frac{78}{3}=26$

(Calculator Allowed)

2. A particle's position, for time interval $-1 \le t \le 1$, is given by the formula $s(t) = 5 + (2t^3-4)^{\frac{5}{3}} - t^2$, $s(t)$ is measured in meters and t is measured in seconds.

a) What is the particles instantaneous velocity at t=0.3

$s'(.3) = 1.65$ m/s

b) Find all the times between $-1 \le t \le 1$ when the particle changes direction. Justify.

Graph $s'(t)$ or $v(t)$ and find where $v(t)$ crosses the x-axis.

$t=0$ & $.079$ because $v(t)$ changes signs.

c) Find all the times when the acceleration of the particle is equal to 0.5 m/s² on the time interval $-1 \le t \le 1$.

$v'(t)=a(t)=.5$

$t=.05$ & $.99$