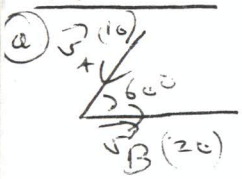
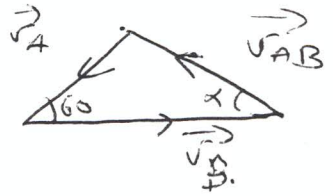
(a) 

(a) $\vec{v}_{AB} = \vec{v}_A - \vec{v}_B$



$\vec{v}_A = -16\cos 60\,\vec{i} - 16\sin 60\,\vec{j} = -8\vec{i} - 8\sqrt{3}\vec{j}$

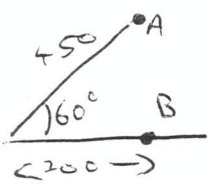
$\vec{v}_B = 20\vec{i} = 20\vec{i} + 0\vec{j}$

$\Rightarrow \vec{v}_{AB} = -28\vec{i} - 8\sqrt{3}\vec{j}$

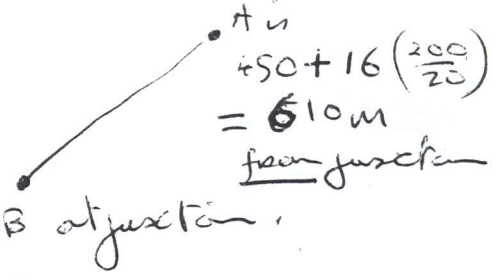
Magn $\Rightarrow |\vec{v}_{AB}| = \sqrt{(-28)^2 + (8\sqrt{3})^2} = \sqrt{784 + 192} = \sqrt{976} = 31.24$

dirn $\Rightarrow$ W of S where $x = \tan^{-1}\frac{8\sqrt{3}}{28} = \tan^{-1}\frac{2\sqrt{3}}{7} = 26^\circ 20'$

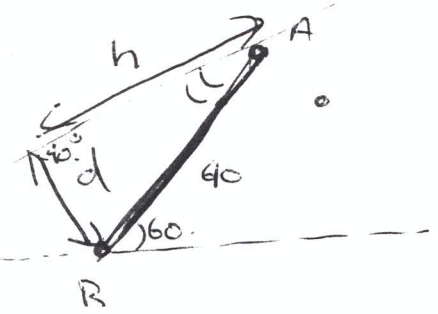
(b) gf



than in past:



Relative Position diagram:



Path

(i) Time to shortest distance = $\frac{h}{|\vec{v}_{AB}|} = \frac{610\cos(180 - 120 - \alpha)}{31.24}$

(Assumed from $\frac{200}{20}$ second in the past)

$= \frac{610\cos(33.67)}{31.24}$

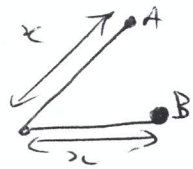
$= \frac{610(.8361)}{31.24}$

$= \frac{510.}{3.24} = 16.32$ secs

$\therefore$ Time from until cars are at position as given in question is

$16.32 - 10 = 6.32$ secs.

(ii) Equidistant from intersection



Let t be time elapsed.

$x = 450 - 16t$.

$x = 200 + 20t$

Equal $\Rightarrow$ $450 - 16t = 200 + 20t$

$\Rightarrow 250 = 36t \Rightarrow t = 6.94$ secs