# Dynamics Meriam 6ed, 2-194

For the instant represented, car $A$ has an accelera-
tion in the direction of its motion, and car $B$ has a
speed of 45 mi/hr which is increasing. If the accel-
eration of $B$ as observed from $A$ is zero for this in-
stant, determine the acceleration of $A$ and the rate
at which the speed of $B$ is changing.



$$V_B = 20.117 \frac{m}{s}$$

$$V_B = 20.117 \,\hat{i} \quad \frac{m}{s}$$



$$\vec{a}_B = \overline{(a_B)_t} + \overline{(a_B)_n}$$

$\vec{a}_{B/A} = 0$ , $a_A = \text{constant}$ , $V_B = 20.117 \frac{m}{s}$ $\begin{cases} \vec{a}_A = ? \\ \vec{a}_B = ? \end{cases}$

$$\vec{a}_B = \vec{a}_A + \underbrace{\vec{a}_{B/A}}_{0} \Rightarrow \boxed{\vec{a}_B = \vec{a}_A} \qquad *$$

$$(a_B)_n = \frac{V_B^2}{\rho} = \frac{20.117^2}{182.88} = 2.213 \frac{m}{s^2}$$

$* \rightarrow \vec{a}_B = a_B(\sin 45 \hat{i} + \cos 45 \hat{j}) = \vec{a}_A \Rightarrow \begin{cases} a_B \sin 45 = (a_B)_n \\ a_B \cos 45 = (a_B)_t \end{cases}$

$$\frac{a_B \sin 45}{a_B \cos 45} = \frac{(a_B)_n}{(a_B)_t} \Rightarrow \tan 45 = \frac{(a_B)_n}{(a_B)_t} = 1 \Rightarrow (a_B)_t = (a_B)_n = 2.213$$

$$\boxed{\vec{a}_B = 2.213(\sin 45 \hat{i} + \cos 45 \hat{j})}$$

$$\boxed{\vec{a}_A = 2.213(\sin 45 \hat{i} + \cos 45 \hat{j})}$$

$$|\vec{a}_A| = |\vec{a}_B| = \sqrt{(2.213 \sin 45)^2 + (2.213 \cos 45)^2} = 2.213\sqrt{2} = 3.130 \frac{m}{s^2}$$