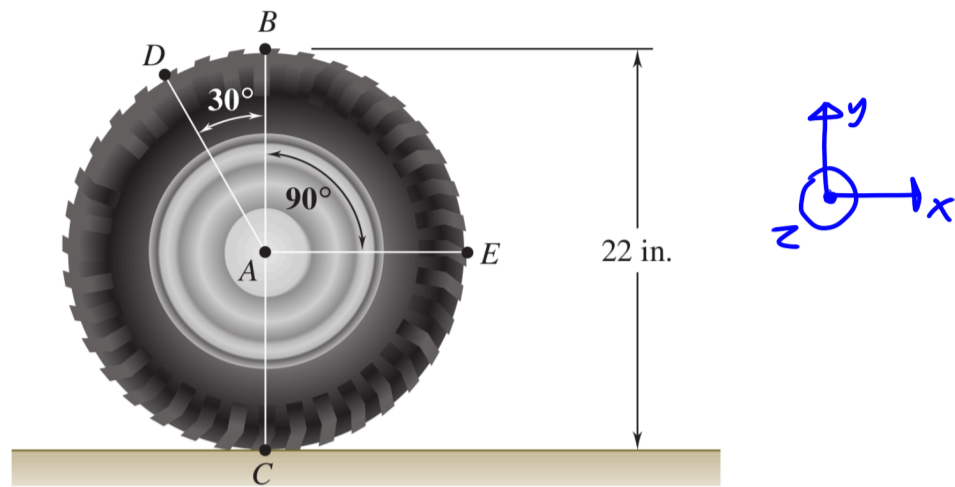An automobile travels to the right at a constant speed of 48 mi/h. If the diameter of a wheel is 22 in., determine the velocities of points B, C, D, and E on the rim of the wheel.

$$48 \frac{mi}{h} \left(\frac{1\ h}{60\ min} \right) \left(\frac{1\ min}{60\ s} \right) \left(\frac{5280\ ft}{1\ mi} \right) \left(\frac{12\ in}{1\ ft} \right) = 845\ in/s$$

$$\vec{V_A} = 845\ i \quad in/s$$

$$w = \frac{|\vec{V_A}|}{c} = \frac{|\vec{V_A}|}{\pi d} = \frac{845\ in/s}{\pi\ 22 in} = 12.2\ rad/s$$

$$\vec{w} = -12.2\ k \quad rad/s$$

$$\vec{V_B} = \vec{V_A} + \vec{w} \times \vec{r_B} \qquad\qquad \vec{r_B} = 11j \ in$$

$$= 845\ i + \begin{vmatrix} i & j & k \\ 0 & 0 & -12.2 \\ 0 & 11 & 0 \end{vmatrix} \begin{matrix} i & j \\ 0 & 0 \\ 0 & 11 \end{matrix} = 845\ i + 12.2 \cdot 11\ i \quad in/s$$

$$\boxed{= 979\ i \qquad\qquad in/s}$$

$$\vec{V_C} = \vec{V_A} + \vec{w} \times \vec{r_C} \qquad\qquad \vec{r_C} = -11j \ in$$

$$= 845\ i + \begin{vmatrix} i & j & k \\ 0 & 0 & -12.2 \\ 0 & -11 & 0 \end{vmatrix} \begin{matrix} i & j \\ 0 & 0 \\ 0 & -11 \end{matrix} = 845\ i - 12.2 \cdot 11\ i \quad in/s$$

$$= 710.8\ i \ in/s$$