\[ v(t) = 5\sin 10t + 8 \cos(10t - 60^\circ) \]

\[ = 5\sin 10t + 8\left(\cos 10t \cos 60^\circ + \sin 10t \sin 60^\circ\right) \]

\[ = 5\sin 10t + 8\left(\frac{1}{2} \cos 10t + \frac{\sqrt{3}}{2} \sin 10t\right) \]

\[ = 5\sqrt{3} \sin 10t + 4 \cos 10t \]

\[ = M \cos (10t + \theta) \]

\[ \therefore M \cos (10t + \theta) = 5\sqrt{3} \sin 10t + 4 \cos 10t \]

Comparing the coefficients of \( \cos 10t \) on both sides,

\[ M \cos \theta = 4 \]

Now, comparing the coefficients of \( \sin 10t \), we get

\[ -M \sin \theta = 5\sqrt{3} \rightarrow M \sin \theta = -5\sqrt{3} \approx -8.66 \]

Therefore,

\[ \theta = -\tan^{-1}\frac{8.66}{4} \approx -65.2^\circ \]

\[ \therefore v(t) = 9.54 \cos(10t - 65.2^\circ) \]