Problem of the Week-4: Extreme Times

Let $\vec{u}$ be the short hand of a clock and $\vec{v}$ be the long hand of the same clock (regarded as vectors in 3D space).

1. Identify all times (to the nearest minute) between 12 am and 6 am at which $\vec{u} \cdot \vec{v}$ is minimum.

2. Identify all times (to the nearest minute) between 12 am and 3 am at which $||\vec{u} \times \vec{v}||$ is maximum.