Exercise 13:

(a) What us the sum V if the twelve vectors that go from the center of a clock to the hours 01:00, 02:00, ..., 12:00?

(b) If the 02:00 vector is removed, why do the 11 remaining vectors add to0 8:00?

(c) What are the components of that 02:00 vector $v = (cos\theta, sin\theta)$?

(a) The sum is the zero vector because of the symmetry.

(b) Because 08:00 is the vector that is symmetric to the 02:00 vector.

(c) Each hour is $-\frac{\pi}{12}$, but our zero is actually at 03:00. So 2:00 is $(cos(\frac{2\pi}{12}), sin(\frac{2\pi}{12}))$

$$cos(\frac{2\pi}{12}) = 0.866025403784439$$

$$sin(\frac{2\pi}{12}) = 0.5$$