1. Show that if $a, b \in \mathbb{R}$ then $C(a+b) = C(a)C(b) - S(a)S(b)$.

2. Show that S and C are periodic with period 2π that is for all x $S(x+\alpha) = S(x)$ and $C(x+\alpha) = C(x)$ is true for $\alpha = 2\pi$ and does not hold for any $0 < \alpha < 2\pi$.

   Hint 1 : Show that if $S(\alpha) = 0$ then $S(\alpha - \pi) = 0$. Hint 2 : Show $C(\pi) = -1$.

3. Show that $S(x) = C(\frac{\pi}{2} - x) = -C(x + \frac{\pi}{2})$ and $C(x) = S(\frac{\pi}{2} - x) = S(x + \frac{\pi}{2})$.