1. In the above figure, we define a “new” angle $\theta$ as it shows in the figure.

(a) If the original signal has electric field amplitude $E_0$, what is the amplitude $E_1$ after the polarizer? (3pts)

$$E_1 = E_0 \sin \theta$$

(b) At what angle $\theta$ ($0 \leq \theta \leq 180^\circ$), the amplitude $E_1$ has the “maximal” value? And what is that maximal value? (3pts)

$$\theta = 90^\circ, \quad E_{1,\text{max}} = E_0$$

(c) At what angle $\theta$ ($0 \leq \theta \leq 180^\circ$), the amplitude $E_1$ has the “minimal” value? And what is that minimal value? (3pts)

$$\theta = 0 \text{ or } 180^\circ, \quad E_{1,\text{min}} = 0$$

(d) Make a plot of the amplitude $E_1$ vs angle $\theta$ (from 0 to 360°) (3pts)

Problem # 2 is on the back.
2. In the lab, the speed of EM wave is 300,000,000 m/s. If the wavelength of EM wave is 600 nm, what is the frequency (Hz) of the EM wave? (3pts)

\[ C = f \lambda \quad \Rightarrow \quad f = \frac{3 \times 10^8 \text{ m/s}}{6 \times 10^{-7}} = 5 \times 10^{15} = 5 \times 10^{14} \text{ Hz} \]