**Problem 3:** (20 pts.) Unpolarized light of intensity 60 W/m^2 is incident on a polarizer with its polarization axis at an angle of 10° away from the vertical. The light then passes through a second polarizer with its polarization axis at an angle of 40° away from the vertical, and a third with its polarization axis at an angle of 100° away from the vertical.

a. (10 pts.) What is the intensity of the light after the third polarizer?

b. (10 pts.) Suppose the middle polarizer were removed. What would be the intensity after the last polarizer?

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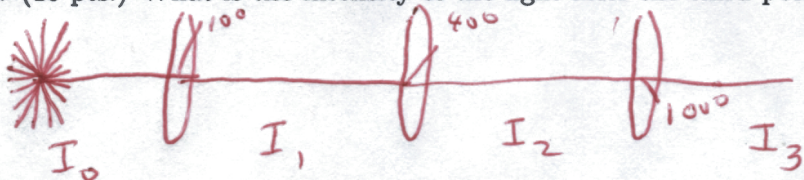
$$I_1 = \tfrac{1}{2} I_0 = 30 \text{ w/m}^2 \quad ; \quad \vec{E}_1 \text{ is at } 10° \text{ from vertical}$$

$$I_2 = I_1 \cos^2(40° - 10°) = 30 \cos^2(30°) = 22.5 \text{ W/m}^2$$

$$I_3 = I_2 \cos^2(100° - 40°) = 22.5 \cos^2(60°) = \boxed{5.625 \text{ W/m}^2}$$

b. (10 pts.) Suppose the middle polarizer were removed. What would be the intensity after the last polarizer?

$$I_3 = I_1 \cos^2(100° - 10°) = \boxed{0}$$