4. [12 points] Suppose $P(\theta)$ is the power, in kilojoules per hour (kJ/h), produced by a solar panel when the angle between the sun and the panel is θ, measured in degrees. Suppose $C(t)$ is the power, in kJ/h, produced by the solar panel t hours after sunrise on a typical summer day. Give practical interpretations of the following.

a. [4 points] $P'(30) = 9$.

Solution: If the angle between the sun and the panel changes from 30 to 31 degrees, the power output of the panel increases by about 9 kJ/h.

b. [4 points] $\displaystyle\int_0^2 C(t)\,dt = 270$.

Solution: In the two hours after sunrise on a typical summer day, the solar panel produces 270 kJ of energy.

c. [4 points] $\displaystyle\frac{1}{12}\int_0^{12} C(k)\,dk = 288$.

Solution: In the first twelve hours after sunrise on a typical summer day, the average power output of the panel is 288 kJ/h.