Determine the cost of energy (in $/kWh) for a wind turbine operating under the conditions given below.

- Rotor Radius: 30 m
- Wind Velocity: 7 m/s
- Air Density: 1.1 kg/m$^3$
- Turbine Speed: 1.0 radians/s
- Interest Rate: 8%
- Turbine Lifetime: 25 years
- Utilization Factor: 0.35
- Turbine Capital Cost: $400,000
- Turbine Annual Operating Cost: $10,000
Equations for Quiz #1

Wind Turbine Power Output:  
\[ \dot{W}_{\text{wt}} = \eta_{\text{wt}} \frac{1}{2} \rho A \dot{v}^3 \]

Turbine Efficiency:  
\[ \eta_{\text{wt}} = -0.020554 (\text{TSR})^2 + 0.18327 (\text{TSR}) + 0.023286 \]

Tip Speed Ratio (TSR):  
\[ \text{TSR} = \frac{\omega R_{\text{rotor}}}{\dot{v}} \]

Utilization Factor:  
\[ U_f = \frac{\text{Actual Energy Output over Time Period}}{\text{Rated Power x Time Period}} \]

Cost of Energy:  
\[ \text{COE} = \frac{\text{Equivalent Annual Cost}}{\text{Actual Energy Output per year}} \]

Economic Conversion Factor:  
\[ (A/P, i, N) = \frac{i(1+i)^N}{(1+i)^N - 1} \]