4.2 a) From eqs 4.5, given the temperatures of the heat reservoirs, the maximum efficiency is

\[ e = 1 - \frac{(20 + 273) K}{(500 + 273) K} \]

\[ e = 0.621 \quad (62\% \text{ efficient}) \]

b) The new efficiency is

\[ e = 1 - \frac{(20 + 273) K}{(600 + 273) K} \]

\[ = 0.664 \quad (66\% \text{ efficient}) \]

If we produced 10 MW of electricity before, we will now be able to produce

\[ 0.664/0.621 = 1.069 \text{ GW of electricity for the same amount of fuel. Thus we have an additional 69 MW to sell. To convert this to kwh for the year we use} \]

\[ \frac{69 \text{ MW} \cdot 1000 \text{ kW} \cdot 365 \text{ days} \cdot 24 \text{ hr}}{1 \text{ MW} \cdot 1 \text{ day}} = 6 \times 10^8 \text{ kwh} \]

This would generate an additional revenue in one year of

\[ 6 \times 10^8 \text{ kwh} \cdot 0.05 \text{ $/kWh} = 31 \text{ M$} \]