Problem 14.58 (Page 189)

A sports car has a mass of 2.3 Mg and accelerates at 6 m/s², starting from rest. If the drag resistance on the car due to the wind is $F_D = 10v$ (N), where v is in m/s, determine the power supplied to the engine when $t = 5$ seconds. Assume an engine efficiency of $\epsilon = 0.68$.

\[
\sum F_x = F - 10v = 2.3 \times 10^3 \times 6 \quad \text{N}
\]
\[
F = 13.8 \times 10^3 + 10v
\]

\[
v = v_0 + a_c t = 0 + 6(5) = 30 \text{ m/s}
\]

\[
P_e = F \cdot v = \left[13.8 \times 10^3 + 10(30)\right](30)
\]
\[
= 423 \text{ kW}
\]

\[
P_i = \frac{P_e}{\epsilon} = \frac{423}{0.68} = 622 \text{ kW}
\]
Problem 14.59 (Page 189)

A 50-lb load is hoisted by a pulley system and motor $M$ as shown. If the motor exerts a constant force of 30 lbs on the cable, determine the power that must be supplied to the motor if the load has been hoisted a distance $s = 10$ ft starting rest. 

$$e = 0.76$$

$$+ \sum F_y = 2(30) - 50 = \frac{50}{32.2} a_b$$

$$a_b = 6.44 \text{ ft/s}^2 = v \frac{dv}{dy}$$

$$+1 \quad v^2 = v_0^2 + 2a_c (s - s_0)$$

$$v_b^2 = 0 + 2(6.44)(10 - 0)$$

$$v_b = 11.349 \text{ ft/s}$$

$$2v_b = -v_m$$

$$v_m = -22.698 \text{ ft/s}$$

$$P_o = F \cdot v = 30 \times (22.698) = 680.94 \text{ ft lb/} \text{sec}$$

$$P_e = \frac{680.94}{0.76} = 895.97 \text{ ft lb/} \text{sec} = 1.63 \text{ hp}$$

Note: $550 \text{ ft lb/} \text{sec hp}$