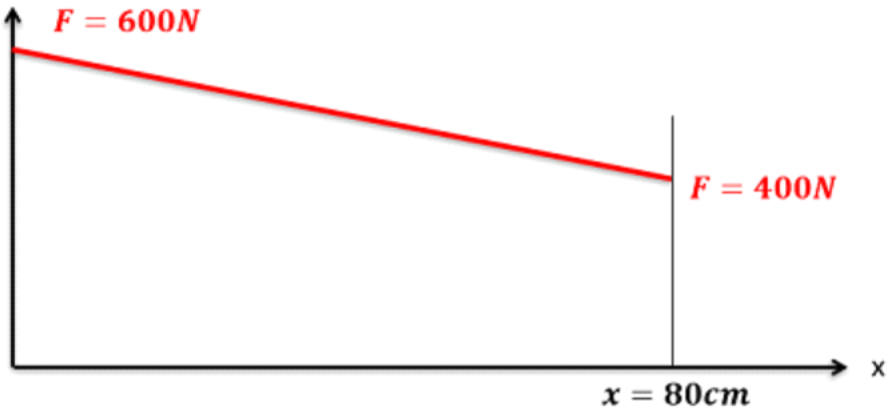
Question 2

A magnetic launch system exerts the force function shown below over its 80cm launch path. Assuming an 80% efficiency, what is the electrical energy we expect to have to put into the system to generate this force function?



$$\eta = \frac{W_{out}}{W_{in}} \qquad W_{out} = \int F(d)$$

$$F(d) = -250d + 600$$

$$W_{out} = \int_0^{.8m} -250d + 600 = \left(-\frac{250}{2}d^2 + 600d\right)\Big|_0^{.8}$$

$$W_{out} = 400\ N_m$$

$$\eta = .8 = \frac{W_{out}}{W_{in}} \rightarrow \boxed{W_{in} = 500\ N_m = 500\ J}$$