Question 2

8.1)

$$E + S \underset{k_2}{\overset{k_1}{\rightleftharpoons}} ES \overset{k_3}{\rightarrow} E + P$$

$$E + S \xrightarrow{k_1} ES$$

$$ES \xrightarrow{k_2} E + S$$

$$ES \xrightarrow{k_3} E + P$$

According to the law of mass action,

$$\frac{d[E]}{dt} = (k_2 + k_3)[ES] - k_1[E][S]$$

$$\frac{d[S]}{dt} = k_2[ES] - k_1[E][S]$$

$$\frac{d[ES]}{dt} = k_1[E][S] - (k_2 + k_3)[ES]$$

$$\frac{d[P]}{dt} = k_3[ES]$$