8.1

$d[S]/dt = k_2[ES] - k_1[S][E]$

$d[E]/dt = k_2[ES] + k_3[ES] - k_1[S][E]$

$d[ES]/dt = k_1[S][E] - k_3[ES] - k_2[ES]$

$d[P]/dt = k_3[ES]$

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$$

and The four equations for the rate of changes in the four species, E, S, ES, and P are as follows:

$$\frac{d[E]}{dt} = k_{-1}[ES] + k_2[ES] - k_1[E][S]$$

$$\frac{d[S]}{dt} = k_{-1}[ES] - k_1[E][S]$$

$$\frac{d[ES]}{dt} = k_1[E][S] - k_{-1}[ES] - k_2[ES]$$

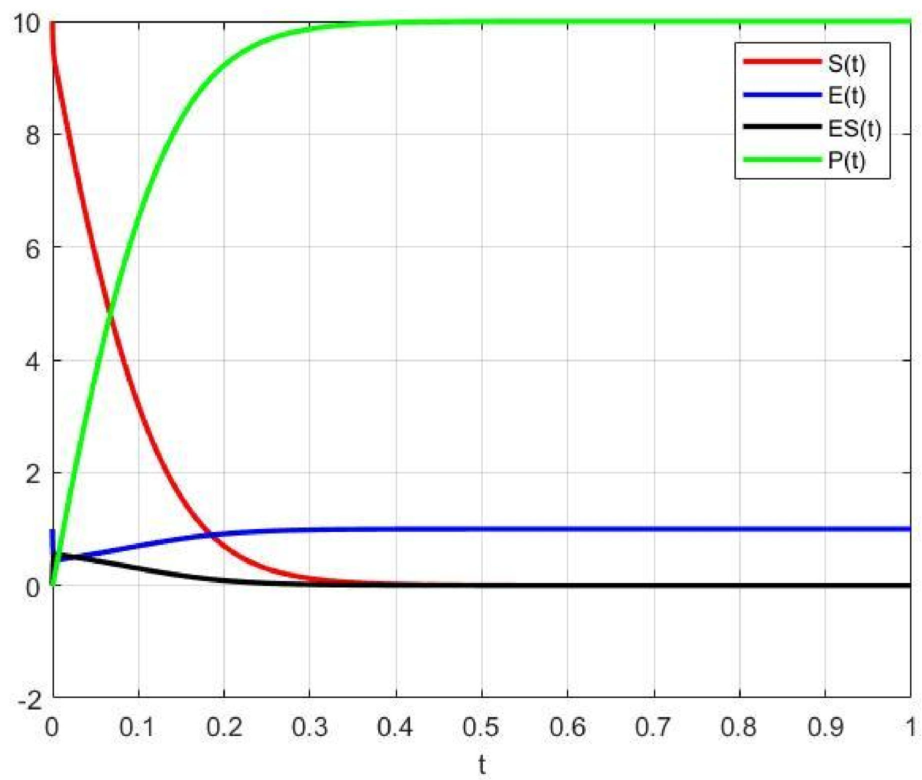
$$\frac{d[P]}{dt} = k_2[ES]$$

8.2

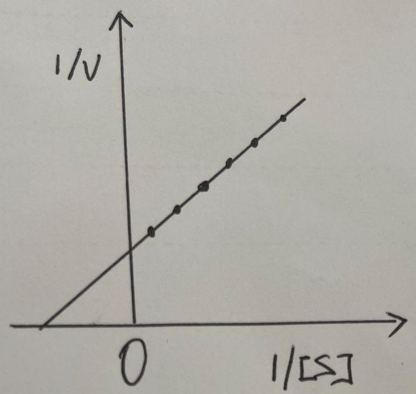
For this exercise, assume that the initial concentration of E is 1 uM, the initial concentration of S is 10 uM, and the initial concentrations of ES and P are both 0. The rate constants are k1=100/uM/min, k2=600/min, k3=150/min

```
clc;
clear all;
close all;
tspan = [0,1];
x0 = [10;1;0;0];
[t,x] = ode45(@myfunY111,tspan,x0);

figure;
plot(t,(x(:,1)),'r-','linewidth',2);
hold on;
plot(t,(x(:,2)),'b-','linewidth',2);
```

```
plot(t,(x(:,3)),'K-','linewidth',2);
plot(t,(x(:,4)),'g-','linewidth',2);
xlabel('t');
legend('S(t)','E(t)','ES(t)','P(t)');
grid on;

function dydt = myfunY111(t,Y)
k1 = 100;
k2 = 600;
k3 = 150;
S = Y(1);
E = Y(2);
ES = Y(3);
P = Y(4);
dydt = zeros(4,1);
dydt(1) =k2*ES-k1*S*E;
dydt(2) = k2*ES+k3*ES-k1*S*E;
dydt(3) = k1*S*E-k3*ES-k2*ES;
dydt(4) = k3*ES;
end
```




8.3




Y-Intercept = 1/Vmax

∴ Vmax = 1/Y-Intercept.