Question 2

8.1

$$V(E) = k_1[E][S] - k_2[E][S] - k_3[E][S] = k_1[E][S] - (k_2 + k_3)[ES]$$

$$V(S) = k_1[E][S]$$

$$V(ES) = k_2[ES] + k_3[ES] - k_1[E][S]$$

$$V(P) = -k_3[ES]$$

8.2

When $t = 0$, $V(E) = V(S) = 1000\mu M/min$, $V(ES) = V(P) = 0\mu M/min$.
The matlab code for the fourth-order Runge-Kutta method is shown as follow.

```
clc; clear all; close all;
h = 0.01
x = 0:h:1
n = length(x)
x(1)=0
y(1)=0
for i = 1:n-1
    k1 = h*fun(x(x(i),y(i));
    k2 = h*fun(x(i)+h/2, y(i)+k1*1/2);
    k3 = h*fun(x(i)+h/2, y(i)+k2*1/2);
    k4 = h*fun(x(i)+h, y(i)+k3);
    y(i+1) = y(i)+(k1+2*k2+2*k3+k4)/6;
end

plot(x, y)
```

8.3