## EVE 290 Introduction to Environmental Engineering

## HW #5

## 4.4

A continuous-flow, completely mixed reactor was operated at various flow rates to collect specific growth-rate data. The specific microorganism growth rate and soluble substrate concentration data are presented below:

S[mg/L]	µ[hr⁻¹]
20.0	0.66
10.0	0.50
6.6	0.40
5.0	0.33
4.0	0.28

Determine  $\mu_{max}$  and  $K_s$  by plotting  $\mu^{-1}$  and  $S^{-1}$  and using the linearized form of the Monod equation shown below:

$$\frac{1}{\mu} = \left(\frac{K_s}{\mu_{max}}\right) \left(\frac{1}{S}\right) + \frac{1}{\mu_{max}}$$

## 4.5

A pure culture of bacteria was grown at 25°C under batch conditions. The following experimental data were collected:

Time[hrs]	Bacterial conc., X[mg/L]
2.0	3470
3.4	3700
4.8	4100
6.1	4400
7.7	4780

Integration of the microbial growth equation  $\left[\left(\frac{dX}{dt}\right)_G = \mu X\right]$  results in  $\ln(X) = \ln(X_0) + \mu t$ , which can be used for determining the specific growth rate of the culture. Determine  $\mu$  and  $X_0$  from a plot of  $\ln(x)$  vs. time.