Math 172 **Quiz 3** **February 3, 2006**

Name _____

1. Consider the dynamical system

$$u(n) = 0.3u(n-1) - 0.5v(n-1) + 30$$
$$v(n) = 0.2u(n-1) + v(n-1) - 4$$

(a) Find the equilibrium point.

(b) Does the equilibrium point appear to be stable or unstable? Show enough work to justify your answer.

(c) For $u(0) = 10$ and $v(0) = 20$, determine the rate at which $v(n)$ goes toward infinity (if unstable) or goes toward equilibrium (if stable). Show the calculations you made to find the rate.

2. For the following dynamical system, there is no equilibrium point, but the values for $u(n)$ (eventually) change by approximately the same amount.

$$u(n) = 0.9u(n-1) + 0.2v(n-1) + 600$$
$$v(n) = 0.1u(n-1) + 0.8v(n-1) + 400$$

(a) What is that approximate amount by which $u(n)$ eventually changes?

(b) Does $u(n)$ appear to be more linear or exponential for large n?