Math 172 **Quiz 2** **February 5, 2008**

Name _____

1. (2 points) Each dynamical system below has an equilibrium value of 20. Determine if this equilibrium value is stable or unstable for each system. You do not need to show your work here.

   (a) $u(n) = 0.8u(n-1) + 4$

   (b) $P(t) = 1.1P(t-1) - 2$

   (c) $v(n+1) = -0.9v(n) + 38$

   (d) $Q(t+1) = 0.95Q(t) + 1$

2. (2 points) Find the equilibrium value for the following dynamical system. Show your work.

$$P(t+1) = 0.4P(t) + 18$$

3. (2 points) Find the equilibrium point for the following dynamical system. Show your work.

$$u(n) = 0.9u(n-1) + 0.8v(n-1) - 14.8$$
$$v(n) = 0.6u(n-1) + 0.8v(n-1) - 3.2$$

4. (2 points) Suppose a doctor prescribes that a patient take an initial dose of 30 milligrams of some drug following by a daily maintenance dose of 45 milligrams. The doctor knows that the level of the drug in the patient's bloodstream will increase over time and approach the target goal of 120 milligrams. What percentage of the drug is eliminated each day from the the patient's bloodstream?

5. (2 points) Suppose you borrow $\$75,000$ at an 9% annual interest rate compounded monthly to be paid back in monthly payments of $1500.

   (a) Write down a discrete dynamical system with initial condition to represent the balance of the loan just after each month's payment.

   (b) How many months will it take to pay back the loan?

   (c) The last payment will be a bit different than each of the preceding monthly payments. To the nearest penny, what will be the amount of this last payment?