

1. Maria makes a single \$1000 purchase on her credit card and then never uses it again. The card carries an 18% annual interest rate compounded monthly, and she only pays back her minimum monthly payment of \$20 per month.

- (a) Write down a discrete dynamical system with initial condition to represent the amount Maria owes after n monthly payments.

$$u(n) = 1.015u(n-1) - 20$$

$$u(0) = 1000$$

- (b) How many months will it take Maria to pay off this credit card debt?

Between 93 and 94 months

- (c) Explain what happens if Maria's single purchase was for \$1500 instead of \$1000.

Her monthly interest would exceed her monthly payment so she would never pay off her credit card debt.

2. A doctor prescribes some drug to be taken every 4 hours. Suppose the body eliminates 30% of this drug every 4 hours. What should the prescribed dosage of this drug be if the doctor wants the equilibrium value (the target goal) to be equal to 120 ml ?

36 ml every 4 hours

3. Find the equilibrium point for the following dynamical system.

$$u(n) = 0.8u(n-1) - v(n-1) + 7$$

$$v(n) = u(n-1) + 1.2v(n-1) - 11$$

The equilibrium point for (u, v) is $(10, 5)$.
