SEQUENCES

1. Give an example of a bounded sequence without a limit.

2. Suppose that you take one 400mg dose of acetaminophen (Tylenol) every 4 hours. The acetaminophen is metabolized so that after 4 hours only 25% of the total amount in your body remains. This means that immediately before you take your second dose, you have only 100mg of acetaminophen in your system. Let d_n be the amount of acetaminophen in your system immediately after the n^{th} dose. This means $d_1 = 400$ and $d_2 = 100 + 400 = 500$.

a) Find a recursive formula for d_{n+1} as a function of d_n.

b) Calculate d_3, d_4, and d_5.

c) Assume $\lim_{n\to\infty} d_n = L$ and take the limit of both sides of your recursive formula from part a. Solve for L.

d) What does L mean in this context?

Date: March 6, 2019.

3. Avery borrows \$16,000 to buy a car. Avery's lender charges an annual interest rate (APR) of 9%, compounded monthly. This means that the monthly interest rate is 0.75%. Avery makes a monthly payment of \$400 **after** the interest is charged. Let A_n be the amount of money Avery owes after n months.

a) Write out the first 4 terms of the sequence $\{A_n\}$.

b) Find a recursive formula for A_{n+1}.

c) (Optional) How long will it take Avery to pay off the loan?

4 (Optional)**.** In this problem we'll consider numbers expressed as continued fractions.

a) Let $a = 1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \ldots}}}$. This means that $a = 1 + \frac{1}{a}$. Solve for a.

b) Do the same thing to solve for $b = 1 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{2 + \ldots}}}}}$