

# Homefun 5

## The Outer Limits

MATH 150  
10 points

**Directions:** Work in groups of 2 to 4 in class and then finish outside of class. Each group should submit **ONE** solution page for the group. (Be sure everyone's name is on it!)

When a person takes a drug, it is introduced into their system and then metabolized over time. A second dose can “stack” on the what remains from the first if it occurs before the first dose is fully metabolized.

For example, patients generally take Klonopin<sup>1</sup> (clonazepam, an anti-seizure medication) 2 or 3 times per day, and it builds up in their system.

1. Look up the half-life  $H$  of Klonopin (in hours) and use it to compute  $r = \left(\frac{1}{2}\right)^{12/H}$ , the fraction left in a person's body from one dose 12 hours later. [We will discuss this kind of model more fully later in the semester.]
2. If someone takes 0.25mg twice per day, the amount  $A$  in their body after  $x$  days (immediately after the second dose) can be approximated by

$$A(x) = 0.25 \frac{1 - r^{2x}}{1 - r}.$$

Write down this function using your value of  $r$  and simplify.

3. What is the long-term maximum in this person's body? (Assume that the day's maximum occurs right after the second dose each day.) That is, find  $\lim_{x \rightarrow \infty} A(x)$ . This will require some estimation, some thinking, and some knowledge of exponential functions.

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<sup>1</sup><https://www.webmd.com/drugs/2/drug-920-6006/klonopin-oral/clonazepam-oral/details>