

MATH 1A – QUIZ 6

PEYAM RYAN TABRIZIAN

Name: _____

Instructions: You have 15 minutes to take this quiz, for a total of 10 points. **Show your work!** May your luck be related to your exponential rate of happiness!

- (1) (3 points) Scientists recently discovered a drug called Peyamphetamine (Pa) which gives you a sudden boost of excitement as well as an eagerness to do math research! They discovered that when Pa is ingested in your body, the number of Pa-molecules grows at an exponential rate of 42 molecules/second. How long does it take until the number of Pa molecules in the body doubles?

- (2) (2 points) Solve the differential equation $T'(t) = 3(T(t) - 2)$ with $T(0) = 6$.

Hint: Let $y(t) = T(t) - 2$. What differential equation does y solve?

Note: You're not allowed to use Math 1B techniques for this!

Date: Friday, October 18th, 2013.

- (3) (5 points) Peyam's utility function U is given by the following **implicit** equation, where B is the happiness from eating broccoli and C is the happiness from eating cake:

$$(U^2 - e^B)^3 = U^3 \ln(C)$$

Assume that at this very moment:

- Peyam's happiness from eating broccoli is $\ln(2)$ utils, and is decreasing by 2 utils/day
- Peyam's happiness from eating cake is e utils, and is increasing by $\frac{3e}{2}$ utils/day

Is Peyam getting happier or sadder at this moment, and at what rate?

Note: Assume that $U > 0$