

Math 32L Lab Quiz #1

Probability and Geometric Series

Blake, Spring 2001

Name: _____

1. (20 points) Suppose you have a fair die. You play a game in which you pick a number on the die and roll the die. If your number comes up, you roll again. You continue to roll until some other number comes up. Your winnings are 3^n dollars, where n is the number of times the number you selected appears. [Note that n is not the number of rolls; rather, $n + 1$ is the number of rolls.]
- (a) What is the smallest amount you could win? What is the probability you would win this amount?
- (b) What is the largest amount you could win?
- (c) If you play once, what is the probability you will win exactly \$3 ?
- (d) If you play once, what is the probability you will win exactly \$81?
- (e) If you play a very large number of times, what would you expect your average winnings to be? Be sure to show clearly how you arrive at your answer. You should express your answer as a precise number. Do not use a calculator to approximate the answer.

(over)

2. (10 points) Suppose a patient takes 20 mg of a drug at the same time every day. After any 24-hour period, only 10% of the amount of the drug which was present at the beginning of the 24-hour period will remain at the end of that period. If the patient continues this regimen for a long period of time, what would be the drug level in the patient's body just after taking the drug on any given day? You should express our answer as a precise number. Do not use a calculator to approximate the answer.

3. (5 points) Let $S = 1 + r + r^2 + r^3 + \dots + r^{N-1}$. Show that $S = \frac{1-r^N}{1-r}$.