

# MS&E 239: Computational Advertising

## Homework 2

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November 22, 2011

1. A honey bee visits flowers placed on the number line, at each integer points  $0, \pm 1, \pm 2, \dots$ . It starts at the flower in position 0 and in each time period, it either moves one step left or right, each with probability 0.5. What is the probability that the bee is at the flower in position  $k$  after  $n = 10$  steps? What about  $n = 20$  steps?
2. A publisher has a total inventory of 200 impressions, that she has allocate between a GD contract and the NGD market. The GD contract has a demand of 50 impressions. In the NGD market, the price density (i.e. density of the highest bid) is given by

$$f(p) = 2(1 - p), \text{ for } p \in [0, 1].$$

How should the publisher allocate the impressions between the NGD market and the GD contract under the following conditions?

- (a) The publisher seeks to maximize her revenue.
- (b) The publisher wants to allocate the “best” ads to the GD contract. (Assume higher priced ads are better).
- (c) The publisher wants to allocate the inventory so that the price distribution in GD mirrors the intrinsic distribution in the total supply.