

NAME: _____

MATH 1180
Midterm III

Do all three problems, use notes as needed. You may hug but not use your calculator.

1. (35 points) A given tree is swarmed by army ants at a rate of 0.05 per day.
 - a. What is the approximate probability that a tree is swarmed on a given day? What is the exact probability?
 - b. What is the expected time until the tree is swarmed?
 - c. What is the expected number of times the tree is swarmed in one year (assume that a year is 360 days for convenience)?
 - d. Use the normal approximation to estimate the probability a tree is swarmed 4 or fewer times in a year.

2. (35 points) Each cow standing in the path of an army ant swarm has a 0.6 chance of not being eaten. A small herd of 6 cows find themselves in the path.
 - a. What is the expected number of cows that will survive?
 - b. Assuming cows are attacked independently, what is the variance of the number of cows that survive?
 - c. What is the probability that all the cows survive?
 - d. If cows are worth \$800 per head, what are the expectation and variance of the value of cows that survive?

3. (35 points) Army ants are beloved by antbirds, who follow them around and pick off any insects that escape the ground assault. A series of replicate plots are set up to see how many army ant colonies and how many antbirds move in. The following table gives the probabilities of different results, where A represents the number of antbirds and C the number of ant colonies.

	$A = 0$	$A = 1$
$C = 0$	0.1	0.05
$C = 1$	0.1	0.15
$C = 2$	0.2	0.40

- Find the marginal distribution for C .
- Find the distribution of A conditional on $C = 0$.
- Are the measurements A and C independent?
- Find the covariance of A and C . What does this number tell you?