MATH 1180
Midterm II

Do all three problems, points as indicated. Don't forget to write your name. No calculators!

1. (30 points) A soothsayer sits at the door of the Roman Senate, where all visitors are permitted to carry concealed daggers. With probability 0.1, he warns entering dignitaries to "Beware the Ides of March". Of those he warns, 70% are assassinated that day. Of all dignitaries, 16% are assassinated.

   a. Rewrite the above information in probabilistic notation.

   b. Are the events "Warned by soothsayer" and "Assassinated" independent? How could you tell?

   c. What is the probability that a dignitary who has NOT been warned is assassinated that day?

   d. What is the probability that a dignitary who was assassinated was first warned?

2. (35 points) Conspiracies against the emperor were rampant in ancient Rome. At any given time, the number of conspiracies is 0 with probability 0.2, 1 with probability 0.3, 2 with probability 0.3, 3 with probability 0.1, and 4 with probability 0.1.

    a. Plot a graph describing these facts.

    b. Find the variance in the number of conspiracies. What does this number tell you?

    c. Suppose the probability of overthrow as a function of the number of conspiracies n is $0.1\sqrt{n}$. What is the overall probability of overthrow?

3. (35 points) Suppose the length T of togas worn in ancient Rome has the p.d.f.

$$f(t) = 4 - 2t$$

for $1 \le t \le 2$ where t is measured in meters. Caesar wears a toga of length 1.8 m.

a. Graph this function. What is the range of this random variable?

b. Find the expectation of T.

c. Find and graph the c.d.f.

d. What is the probability that a random Roman has toga shorter than Caesar's? What is the percentile of Caesar's toga?

e. Write the equation you would solve to find the median. Is the median greater than 1.5?