

# MTH 1250

## Worksheet (9/23/09)

### “Bayes’ Theorem”

- (1) Doctors have devised a blood test for polymyalgia. Polymyalgia is a rare disease. Only about 1 of every 1000 people have it. Extensive studies have confirmed that the test reads positive 99% of the time on patients who actually have polymyalgia. On the other hand, the test produces some false positive results: 2% of patients who do not have polymyalgia produce a positive blood test. Suppose that you have the blood test run and the result comes back positive. Based on that information, what is the probability that you have polymyalgia?
- (2) Twenty percent of people who have not completed college earn more than \$30,000 annually. The probability that a person with a Bachelor’s degree or higher earns more than \$30,000 is 0.6. Among adults chosen at random, the probability of having at least a Bachelor’s degree is 0.3. What is the probability that a randomly chosen person has at least a bachelor’s degree if it is known that the chosen person earns more than \$30,000?
- (3) A candidate for governor knows that she has a 60% chance of being elected if she is nominated by her political party. If she is not nominated, then the party has only a 50% chance of winning the election. She has only a 25% chance of being nominated by the party. What is the probability that she is the winning candidate, given that her party wins the election?
- (4) A self-administered intelligence test detects 85% of those who are idiots, but fails to detect real idiots 15% of the time. It is 90% accurate in detecting non-idiots, but indicates that 10% of non-idiots are idiots. Suppose that it is known that 1% of people are idiots. A person takes the test and the test says that the person is an idiot. What is the probability that the person really is an idiot?