Math 29
Homework problems for Exam 2

(1) Last night at midnight two spiders made their home in my office and began to reproduce. After 24 days, there are 100 spiders in my office. After how many days will there be a million spiders in my office?

(2) I got a chocolate stain on my shirt and I am trying to remove it by washing the shirt repeatedly in hot water. I find that each time I wash it, the stain decreases by $\frac{1}{5}$. How many times do I have to wash my shirt to remove at least 99% of the stain?

(3) You earn $5000 during the summer before you start college. You plan to put the money in the bank from September 1 of your freshman year until June 1 after graduate. You are considering two accounts. One gives 1.8% annual interest compounded continuously, and the other gives 2.3% annual interest compounded weekly. Is one better or are they the same? You should assume that every month has 4 weeks and there are $48 = 4 \times 12$ weeks in a year.

(4) You are told on August 1 that you have won a scholarship. The scholarship will pay you $200 at the start of every month from September 1 to June 1 of your first year of college. Given that banks are offering 2.4% annually compounded continuously, what is the present value of all of this money on the day you find out about it?

(5) Ali decided that the best way to save for his son's college education is to deposit $10 into a special bank account every week. He starts doing this the day his son is born, and does it every week for 18 years. His last deposit is one week before his son turns 18. On his son's 18th birthday Ali withdraws all the money. Suppose that the account pays 2.8% annually compounded daily. How much money will he have when he withdraws it all? You should assume that every year has 364 days so that a year is exactly 52 weeks.

(6) A radio broadcasting antenna is put on top of a building. From a point which is 85 feet from the base of the building the angle of elevation of the top of the building is 35° and the angle of elevation of the top of the antenna is 50°. How tall is the antenna?