Mathematics 172 Homework

The material below is also covered in pages 11–14 of the text.

Answer the following based on what we did in class today and on the notes in the last homework assignment.

1. A species of pea is an annual plant. That is every it dies at the end of the year and all the next years pea plants come from the previous years seeds. Thus the death rate is 100%. That is $d = 1.0$. It was a birth rate of $b = 1.3$ plants/plant.

(a) What is the discrete growth factor, r. *Answer:* $r = (b - d) = .3$.

(b) What is the finite rate of increase λ? *Answer:* $\lambda = 1 + r = 1.3$.

(c) If a field starts with 30 pea plants then give a formula for the number of plants after t years. *Answer:* $N_t = 30(1.3)^t$.

(d) How long until there are 10,000 pea plants? *Answer:* $t = 2.14$ years.

2. Squirrel breed once a year. If we observe that the birth rage of squirrels is $b = .74$ squirrels/squirrel and that if we start with a population of ten squirrels that in 3 years we have 14 squirrels, then find the death rate of the squirrels. It may be essayist to do this in the following steps.

(a) Find a formula for the number of squirrels after r years. *Answer:* $N_t = 10\lambda^t$. Since $N_3 = 14$ this gives the equation $10\lambda^3 = 14$ which we can solve for λ to get $\lambda = (14/10)^{1/3} = 1.119$. This is the finite rate of increase.

(b) Find the discrete growth factor, r. *Answer:* $r = \lambda - 1 = 1.119 - 1 = .119$.

(c) Find death rate d. We know that $r = b - d$. In our case this gives $.119 = .74 - d$ so we can solve for d and get $d = .74 - .119 = .621$ squirrels/squirrel.