Take Home Exam 2

1. The frequency distribution of the value x of a polygenic trait follows a bell curve because most of the values cluster around an average, with only a few individuals clustered towards the extreme values. The reason for this is because polygenic traits involve multiple genes with each gene contributing only a small amount toward the phenotype. There would be a large number of possible combinations of alleles and therefore phenotypes, but the combination of dominant and recessive alleles would eventually average out and follow a bell curve distribution, following the central limit theorem (Figure 1). In contrast, a phenotype with only a single gene would have a defined mean towards one end of the spectrum and the frequency would be much higher towards the dominant end of the spectrum (Figure 2).
2. For this situation, the null hypothesis would be that the mean of the normally distributed population is equal to 45mm. The alternate hypothesis that would be tested is that the mean of the population has shifted to be greater than 45mm.

To test the skeptic’s claim, we would have to find the p-value within the normal distribution of the population mean. To find the distribution of the mean, we would use the Central Limit Theorem. If the P value is lower than the significance level chosen, such as 0.05, then we would reject the null hypothesis and accept the alternate hypothesis that evolution has occurred.

1. A. When ΔT=50, N(t1)= 7.4, N(t2)= 14.8, the intrinsic rate of growth (r) would be…

ln(N(t2)) – ln(N(t1))/t2-t1 = r r= 0.0139

The projected population for year 2040 would be…

N(t)= Noe r\*t  7.4\*e0.0139\*24 = 10.33 billion

B. r= ln(N(t2)) – ln(N(t1))/t2-t1 = ln(3250) – ln(3000)/1 = r= 0.08

N(t)= 3000e 0.08\*6 N(t) = 4,848.22 beetles

C. r=0.5047

D. No=100, Ne=112, ln(N(t2)) – ln(N(t1))/t2-t1 = r r= 0.113

T=ln2/0.113= 6.134 years

1. A. max growth rate = r\*k/4 = 0.08\*400/4 = 8 butterflies per month

B.