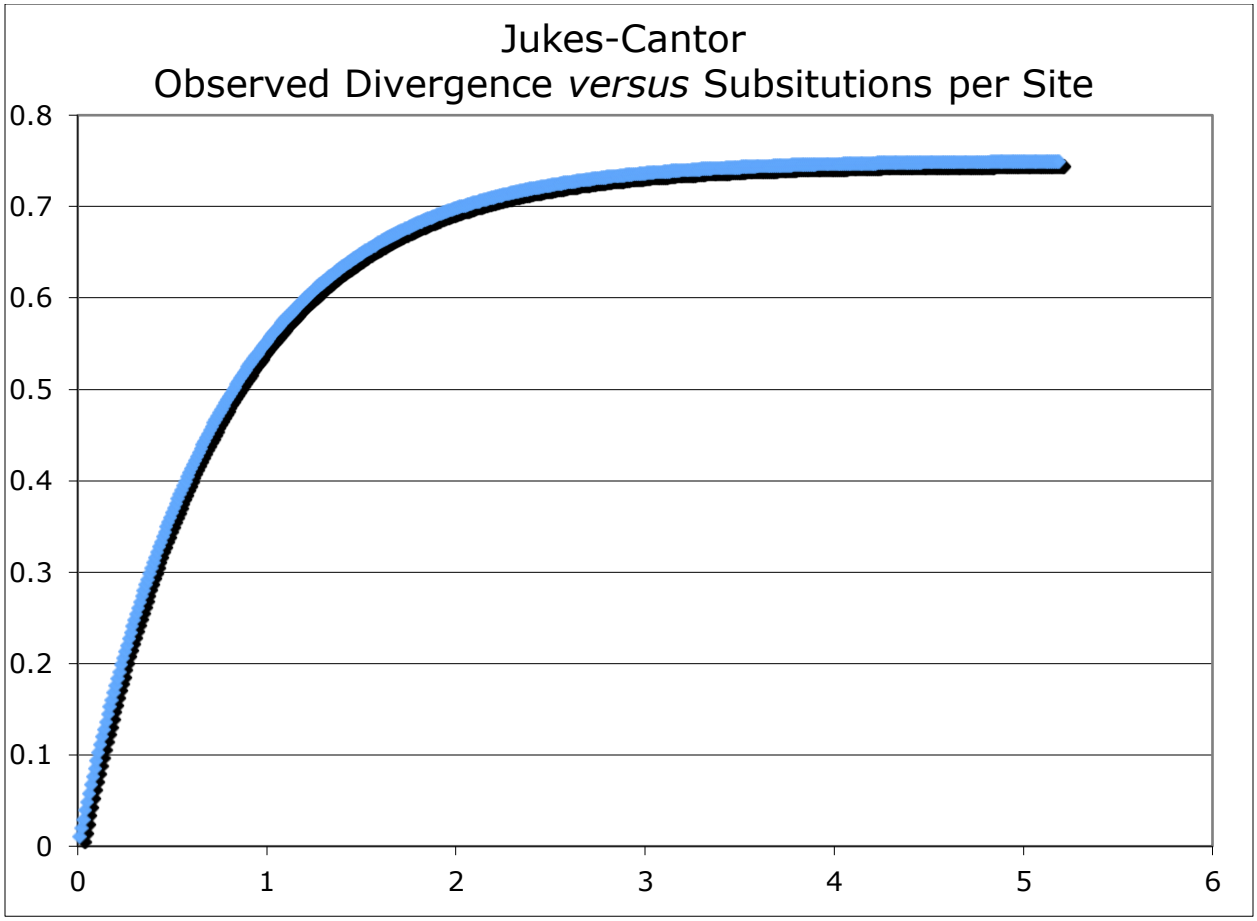
Pop-up quiz #1

Name: _____

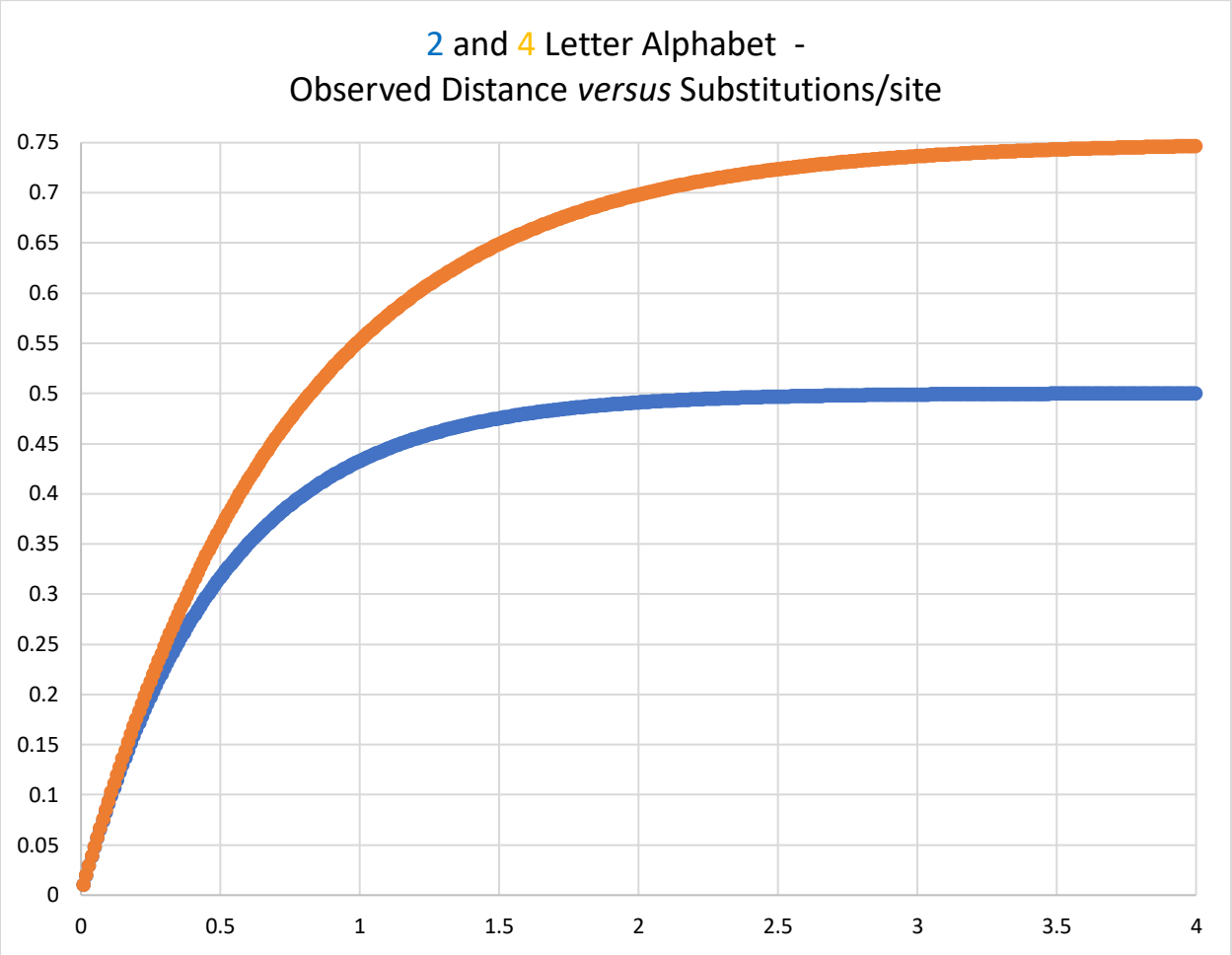
Assignment for today was to think about how the relationship of observed sequence divergence as a function of occurred substitution changes, when the letters (nucleotides or amino acids) do not occur with the same frequency.
Below is the Jukes Cantor relationship for nucleotide sequences, assuming that the 4 nucleotides occur with the same frequency (i.e., 0.25).

Draw a sketch of the relationship you expect if the nucleotides occur with unequal frequency (the average frequency remains the same during the substitutions).
The assignment suggested to think about a sequence consisting only of two nucleotides.
Can you draw this curve into the coordinate system below?



Your comments:

Answer with Excel:



Note: Assuming a substitution rate of 10^{-8} per site and per year, then 4 substitutions per site will occur in

$4=10^{-8}$ x number_of_years ->

number_of_years = $4*10^{8}$ years

= 400 million years

= 0.4 billion years

(aka giga years or GY – giga years is a less ambiguous unit, because continental Europe considers 10^{9} a milliard, and a billion in most of central Europe is 10^{12}).

See Wikipedia on long and short scales

gya stands for giga years ago

Sequences that diverged .2gya are separated by .4 billion years of independent evolution, i.e., about 4 substitutions per site, provided not selection kept the sequences similar.