Throughout this semester I...

- Learned how to use baker’s percentage
- Learned the difference between baking in volume and weight measurements
- Explored logistic and logarithmic functions
- Modeled increase in Omega-3 fatty acids throughout the bread making process
- Created a complex, precise, and aesthetically pleasing cutting board using Euclidian Constructions
- Made a presentation about teaching Hyperbolic Geometry

The Bacon Cheesy bread had a fairly high hydration percentage (68%), but when we cooked it, the loaf came out too moist. After reviewing our recipe, we discovered our bread really had a 83% hydration percentage! It was because the cheese melted into a liquid. In the future, we need to change the quantity of water to compensate for the other ingredients.

For our final loaf, we made chocolate cinnamon bread. The first loaf we made was so wet (with an 88% hydration percentage), it was impossible to knead. It was wet because we needed to compensate for the dry cocoa powder. Our final loaf used less water (60%), and much less cocoa powder for a balanced texture. Our bread tastes great now and is much easier to knead!

Exponential Growth in Wheat Seeds

A single wheat seed can grow into a sheaf of 40 seeds during a season, each new seed grows into 40 more seeds the next season. This growth can be modeled exponentially as $y=40^x$.

**How long will it take one seed to feed the world for a day?**
Suppose everyone needs 500 wheat berries to make bread for a day. The world population is 7 billion, times 500 is 3500 BILLION wheat seeds needed. You can make $y=40^x$ a logarithmic function and discover how many seasons it takes to grow 3500 BILLION wheat seeds! I completed this task, and discovered it takes only 7.82 seasons to feed the world for a day!

Increase in Yeast Cells During Fermentation

At first, I thought yeast cells reproduced in an exponential fashion. For example, 2 cells turn into 4, then 8, 16, etc. I soon realized yeast cells reproduce in a logistic fashion, where they increase, then plateau, resulting in an asymptote. The yeast cells plateau because there is a lack of food for them to eat. Logistic functions are commonly used for situations with a “max” amount, such as bacterial growth and island populations. The equation for a logistic function is left.

$$f(x) = \frac{L}{1 + e^{-k(x-x_0)}}$$

$x_0$ is sigmoid’s midpoint (the middle of the s-curve), L is the curve’s maximum value. k is the steepness of the curve (could also be thought of as the derivative in my opinion.). Lastly, e is called Euler’s number, it is equal to 2.71828.
How Does the Amount of Omega-3 Fatty Acids Change Throughout the Bread Making Process?

By Lucy Conover

Piecewise Function

\[ f(d) = \begin{cases} 
-4.01(d) + 32.11 & \{1 \leq d \leq 8\} \\
0.23(d) - 1.84 & \{8 \leq d \leq 128\} \\
-4.34(d) + 583 & \{128 \leq d \leq 129\} \\
26.84(d) - 3439 & \{129 \leq d \leq 130\} 
\end{cases} \]

Note: All values are out of 108 grams, for example, there are 28.1 mg of Omega-3 in 108 grams of wheat seeds.

Note: It takes about 4 months for spring wheat to grow.

Derivative Descriptions

Since my graph is made up of linear functions, the derivative of each line segment is the equivalent of the slope. The greater derivatives mean the Omega-3 increases over a short amount of time, while the lesser ones mean the Omega-3 increases at a slower rate.

The Process

a: Wheat Berry, Day 1
b: Wheat Grass, Day 8
c: Sheaf of Wheat, Day 128
d: Flour, Day 129
e: Dough, Day 129
f: Risen Dough, Day 129
g: Baked Bread, Day 130