

Rationals in the Kitchen: Performance Task*

(without scaffolding)

*Originally composed using ChatGPT

Let's Make Macaroni & Cheese

Which cheese should we use? When making macaroni and cheese, it's important for the cheese to have a creamy consistency—otherwise the noodles clump together. No one wants clumpy macaroni. Let's investigate how we can make the optimal macaroni and cheese!

To do that, we need to understand the relationship between the melting point of a certain type of cheese and the percentage of fat it contains. For some cheeses, you can reference the following function between melting point and percentage of fat:

$$f(x) = 180 + \frac{50x}{5-x}$$

How can this relationship be used to determine the percentage of fat that produces the highest melting point for the cheese?

<p style="text-align: center;">Model</p> <p><i>Explain/Create the models to solve this problem. Identify limitations to your model.</i></p>	<p style="text-align: center;">Solve</p> <p><i>Show your work!</i></p>
<p style="text-align: center;">Analyze</p> <p><i>What does your solution mean in context of the problem? What conclusions can you draw based on your results?</i></p>	

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Which cheese should we use? When making macaroni and cheese, it's important to have a creamy consistency to the cheese—otherwise the noodles clump together. And no one wants clumpy macaroni. Let's investigate how we can make the optimal macaroni and cheese!

To do that we need to understand what is the relationship between the melting point of a certain type of cheese and the percentage of fat it contains? For some cheeses, you can reference the following function between melting point and percentage of fat:

$$f(x) = 180 + \frac{50x}{5-x}$$

How can this relationship be used to determine the percentage of fat that produces the highest melting point for the cheese?

1. Looking at the function: $f(x) = 180 + \frac{50x}{5-x}$
 - a. What does x represent in the given function?
 - b. What does $f(x)$ represent in the given function?
2. If we want to solve, what is the first step in finding the percentage of fat that produces the highest melting point for the cheese?
3. How do you find the **critical points** of the function $f(x)$? Find them.
4. What is the meaning of a **vertical asymptote** in the context of this problem?

5. What is the **limit** of the function as x approaches 5 from the left and from the right?

6. Based on your findings, what conclusion can you make about the relationship between the melting point of cheese and the percentage of fat it contains?

7. Now that you know, what are some of the best cheese choices for macaroni and cheese? Use the internet to help you investigate cheeses if needed!

8. Mathematical models don't always match what we see in the real world. What are some additional factors that should be considered when determining the melting point of cheese?