

1. **Dessert:** Given  $f(x) = x^x$ , find  $f'(x)$ .

- (a) Assume you are writing a multiple choice exam, and the question is Given  $f(x) = x^x$ , find  $f'(x)$ . Write a possible answer that might make sense to a beginning Calculus student. Explain why the answer might make sense.
- (b) Repeat part (a) with a different possible answer. Again, explain why this second answer might make sense.
- (c) Find the correct answer. Explain why your answer is actually correct and not just “makes sense.”

2. **Deriving with derivatives**

The cheer lets us remember formulas for  $\sin(\alpha + \beta)$  and  $\cos(\alpha + \beta)$ . Pretend you only remember the first part for of the cheer, but don't recall the second. Show how you can use derivatives to get from the equation  $\sin(\alpha + \beta)$  to the equation for  $\cos(\alpha + \beta)$ . [Hint: Consider the function,  $f(x) = \sin(x + \beta)$ .]

Explain which derivative rule(s) you used and how you used it/them.

3. Demonstrate how to use function machine diagrams, Leibnitz notation, and the chain (change rule) to find the derivative of  $y = f(x)$  with respect to  $x$  when:

$$f(x) = \ln(\sin^3(x^2))$$

4. For what values of the constants  $a$  and  $b$  is  $(1, 6)$  a point of inflection of the curve  $y = x^3 + ax^2 + bx + 1$ ?