Math 263A **Guide for Test 4**

Here are some sample questions from sections 3.3–3.5 and 3.7. Some topics that we covered are not represented by these questions, but are still fair game.

1. You accidentally eat 10,000 salmonella bacteria on some undercooked chicken. In two hours the population has grown to 100,000. Assuming exponential growth, how many salmonella will be living in your intestine five hours after you ate the chicken?

2. Compute the following derivatives:

   (a) $f(x) = \arctan(x) \Rightarrow f'(x) =$

   (b) $f(x) = \ln(x) \Rightarrow f'(x) =$

   (c) $f(x) = \log_3(x) \Rightarrow f'(x) =$

   (d) $f(x) = \dfrac{\arctan(\log_3(7x))}{x^4 + 2x} \Rightarrow f'(x) =$

   (e) $f(x) = e^x \Rightarrow f'(x) =$

   (f) $f(x) = 3^x \Rightarrow f'(x) =$

   (g) $f(x) = x^3 \Rightarrow f'(x) =$

3. Find the derivative of $y = \dfrac{x^x \sin(2x)(x^5 - 7x)^6}{(\sqrt{x^9 + 1})3^x}$

4. Compute the following limits:

   (a) $\displaystyle\lim_{x\to\infty} \frac{e^{3x}}{x^3} =$

   (b) $\displaystyle\lim_{x\to-\infty} \frac{3e^{3x} - 4}{2e^{3x} - 2} =$

   (c) $\displaystyle\lim_{x\to 1} \frac{\ln(x)}{\sin(\pi x)} =$

   (d) $\displaystyle\lim_{x\to\infty} x\tan(1/x) =$