1. This is an open notes and open book quiz. You may also use resources available on ELC or the class website, as well as a calculator (although a calculator should not be necessary).
2. You may not use any other resources and may not consult with any person other than the course instructor.
3. **All answers should be exact**, i.e. no numerical approximations unless otherwise specified.
4. You are graded on your solution, but **more importantly you also graded on your supporting arguments and work you use to justify your answers**.
5. **Please submit your completed quiz on Gradescope by Friday, 26 March.**

By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else:

Name (sign): _____ Name (print): _____

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1. (10 points) Solve each of the following equations for the independent variable x, where all of the Greek letters appearing are unknown positive real numbers.

   1.

$$\alpha = \delta \cdot \beta^{x^2+\rho} + \tau.$$

   2.

$$\alpha = \delta \cdot \log_\beta(\Lambda \cdot x^\varepsilon - \tau).$$

You may continue your work for the previous question here.

2. (10 points)

    1. A student loan is taken out that has a 6.3% annual interest that is compounded **monthly**. At what time t (in years) will the amount owed on the loan equal 110% of the initial balance?

    2. A student loan is taken out that has a 6.3% annual interest that is compounded **continuously**. At what time t (in years) will the amount owed on the loan equal 110% of the initial balance?

3. Which loan is preferable? Explain and justify why in 1-2 mathematically precise sentences.

You may continue your work for the previous question here.

3. (10 points) Suppose that the mass of an incubated colony of bacteria is modeled by an exponential growth or decay function $A(t)$.

   1. Suppose you record the following two measurements:

      $$(t_0, A(t_0)) = (2, 2700) \quad \text{and} \quad (t_1, A(t_1)) = (4, 6000),$$

      where t is measured in hours and $A(t)$ is measured in grams. Write down a function that models the weight as a function of t.

      Hint: the original function may have unknown parameters, but the formula for your model should only include actual known numbers and one independent variable.

   2. Suppose that you need to remove the colony from incubation when the mass reaches 5×10^4 grams. At what time t (in hours) will this occur?

3. Suppose that the time $t = 0$ corresponds to Friday afternoon at 5:00 PM. Do you need to return to the lab before 9:00 AM Monday morning to remove the colony from incubation?

You may continue your work for the previous question here.

4. (10 points) **(Extra Credit): Find a cool math video.**

   Find an online video which discusses a mathematical topic that might be of interest to people outside of a math class. This can be from sites like Youtube or other social media (provided it's publicly viewable).

   Write 3-4 precise sentences explaining or summarizing the mathematical idea, as though you were explaining it to a friend or relative. If you use words that fall under "mathematical vocabulary" or terminology, try to explain what those words mean.

   Here are a few places you can look to get started:

   1. Vihart
   2. Numberphile
   3. 3Blue1Brown
   4. Mathologer
   5. Stand-up Maths
   6. Henry Segerman
   7. Tipping Point Math