This quiz covers everything done in class on January 12, 14, and 16, and the types of homework problems assigned on those days.

Reminder: The quiz is on Wednesday January 21. There will be an optional review session on Tuesday January 20 at 1:00pm in Bailey 207.

- **Logarithmic functions**
  A. Definition: \( \log_a x \) is the inverse of \( a^x \).
  - \( d \log_a x = \frac{1}{x} \) and \( \log_a a^x = x \).
  - \( \log_a x = y \) exactly when \( a^y = x \)
  - Graph and domain of a logarithmic function.
  - Definition of the natural logarithm.

B. Log rules
  - Rules for \( \log_a(xy), \log_a \left( \frac{x}{y} \right), \log_a x^y \), and computations.

C. Solving equations involving logarithms and exponentials.

D. The derivative of the natural log
  - \( \frac{d}{dx} \ln x = \frac{1}{x} \) and \( \frac{d}{dx} \ln g(x) = \frac{1}{g(x)} \cdot g'(x) \)
  - Proof
  - Computations

- **Derivatives of general logarithms and exponentials**
  A. Differentiating \( f(x) = g(x)^{h(x)} \)
  B. Differentiating \( \log_a f(x) \)
    - Key: Use the change of base formula for logarithms to write
      \[
      \log_a(f(x)) = \frac{\ln(f(x))}{\ln(a)}
      \]
    - Proof of the change of base formula:
      \[
      \log_a(x) = \frac{\ln(x)}{\ln(a)}
      \]

- **Antiderivatives**
  A. Definition of antiderivative (also called an indefinite integral)
    - \( \int f(x) \, dx = F(x) + C \) means exactly \( \frac{d}{dx} [F(x)] = f(x) \).
  B. Basic indefinite integrals
    - Know indefinite integrals for powers of \( x \), \( e^x \), six integrals for trig functions.
  C. More complex calculations
    - Theorem on sums and products:
      \[
      \int af(x) + bg(x) \, dx = a \int f(x) \, dx + b \int g(x) \, dx
      \]
    - Computing integrals by manipulating the integrand until it matches a sum of things on the list of “Basic indefinite integrals.”