1. What is the formula we found for the derivative of \( \log_b(x) \)?

\[
\text{We found } (\log_b(x))' = \frac{1}{\ln b} \cdot \frac{1}{x}
\]

2. At what \( x \) coordinate on the graph of \( y = \log_2(x) \) is the slope exactly 1?

We're being asked to find \( x \) for which \( y'(x) = 1 \), or, \( \frac{1}{\ln 2} \cdot \frac{1}{x} = 1 \)

Solving for \( x \) gives \( x = \frac{1}{\ln 2} \approx \frac{1}{0.693} = 1.442 \ldots \)

[Note: the problem is NOT asking "what's \( y'(1) \)." It's showing that \( y'(1.442) = 1 \). Put the 1 in the right place!]

3. Suppose \( f'(a) \) exists for some function \( f \). What is the "new, improved" formula we developed in class for approximating \( f'(a) \)?

When \( f'(a) \) exists, then

\[
f'(a) \approx \frac{f(a + h) - f(a - h)}{2h}
\]

(but be ware! it's possible that \( \lim_{h \to 0} \frac{f(a + h) - f(a - h)}{2h} \) exists even if \( f'(a) \) does NOT! An example is \( f(x) = |x| \) at \( a = 0 \). The point here is: only use this approximation when you already know \( f'(a) \) exists.)

4. What is the formula we've developed for \( \frac{d}{dx} b^x \)?

It's \( (\ln b) b^x \)

5. Using the answer to problem (4), what is the slope of the graph of the function \( f(x) = 3.5^x \) at \( a = 2.5 \)?

\[
f(x) = 3.5^x
\]

so \( f'(x) = (\ln 3.5) 3.5^x \) and \( f'(2.5) = (\ln 3.5) 3.5^{2.5} \approx 28.71038 \ldots \)

6. Using \( h = 0.01 \), what is the approximation given by the formula in problem (3) to the answer to problem (5)?

\[
\text{It's } \frac{f(2.51) - f(2.49)}{2 (0.01)} \approx 28.7111361
\]