**1.** 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 $\boxed{f'(a) \approx \dfrac{f(a+h) - f(a-h)}{2h}}$

(but be aware! it's possible that $\lim_{h \to 0} \dfrac{f(a+h) - f(a-h)}{2h}$ exists yet $f'(a)$ doesn't... consider $f(x) = |x|$ at $a = 0$. The point is, only use this formula when you already know $f'(a)$ exists)

**2.** What is the formula we've developed for $\dfrac{d}{dx}\, b^x$ ?

$\frac{d}{dx}\left(b^x\right) = (\ln b)\, b^x$

**3.** Using the answer to problem (2), what is the slope of the graph of the function $f(x) = 2.5^x$ at $a = 3.5$?

$f'(x) = (\ln 2.5)\, 2.5^x$

$\therefore\ f'(3.5) = (\ln 2.5)\, 2.5^{3.5} \approx 22.63723\ldots$

**4.** Using $h = 0.01$, what is the approximation given by the formula in problem (1) to the answer to problem (3)?

$$\frac{f(3.51) - f(3.49)}{2(0.01)} \approx 22.63754\ldots$$

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

it's $\dfrac{1}{(\ln b)} \cdot \dfrac{1}{x}$

**6.** At what $x$ coordinate on the graph of $y = \log_3(x)$ is the slope exactly 1?

So we want $y'(x) = 1$

ie. $\dfrac{1}{\ln 3} \cdot \dfrac{1}{x} = 1.$ → solve for $x$ to get $x = \dfrac{1}{\ln 3} \approx \dfrac{1}{1.0986\ldots} \approx 0.91023\ldots$

[We are <u>NOT</u> finding $y'(1)$ here! We're showing that $y'(0.91023\ldots) = 1$ — PUT THE "1" in the RIGHT PLACE!]