

The goal here is to approximate \sqrt{x} for values near $x = 4$ without a calculator, using tangent lines.

Let $f(x) = \sqrt{x}$.

1. Pick a value x_0 near $x = 4$ where you *know* $\sqrt{x_0}$ (without using a calculator). The point $(x_0, \sqrt{x_0})$ is on the graph of $f(x) = \sqrt{x}$.
(*Hint*: Since we're not using calculators, square a number close to 2)
2. Use the points $(4, 2)$ and $(x_0, \sqrt{x_0})$ to approximate $f'(4)$.
3. Find an equation for the line tangent to the graph of $f(x)$ at $x = 4$.
4. Plot $f(x)$ and the tangent line on the same set of axes. Do they look close to each other near $x = 4$?
5. Use your equation of the tangent line to approximate $\sqrt{4.01}$. How close is your answer to the "real" value?
6. Use the same process to approximate $\sqrt{8.95}$.
(*Hint*: Look at the tangent line near $x = 9$.)

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