MATH 121

THE DEFINITION OF THE DERIVATIVE

GOALS

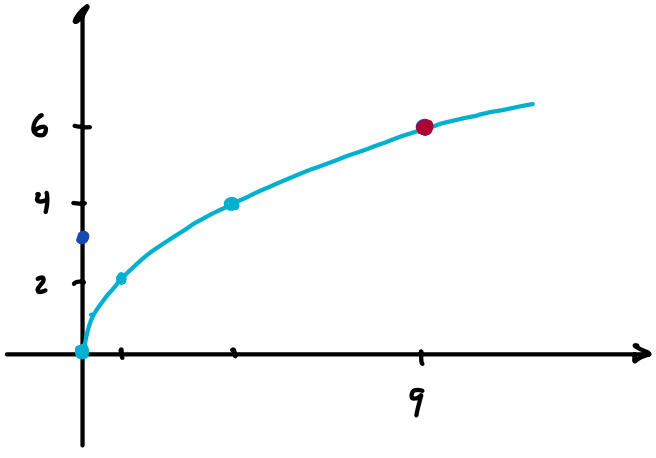
- ☐ DEFINE THE DERIVATIVE USING LIMITS
- ☐ APPLY THE LIMIT DEFINITION OF THE DERIVATIVE TO COMPUTE f' FOR QUADRATIC FUNCTIONS, SQUARE ROOT FUNCTIONS, $1/x$, AND MORE
- ☐ USE THE DERIVATIVE OF A FUNCTION TO FIND EQUATIONS OF TANGENT LINES
- ☐ INTERPRET GRAPHS
  - ☐ ESTIMATE DERIVATIVE VALUES
  - ☐ IDENTIFY POINTS WHERE f IS NOT DIFFERENTIABLE

NOTATION

DEFINITION

EX: $f(x) = 2\sqrt{x}$. COMPUTE f' AND USE IT TO GET TANGENT LINE AT $x = 9$.

TANGENT:



DIFFERENTIABILITY IF f' IS CONTINUOUS, WE SAY f IS DIFFERENTIABLE.

e.g. $f(x) = |x| = \begin{cases} x \; ; \; x \geq 0 \\ -x \; ; \; x < 0 \end{cases}$

* WHEN f IS **DIFFERENTIABLE** ITS GRAPH IS...

EX: USING THE LIMIT DEFINITION, COMPUTE THE DERIVATIVE OF $f(x) = 3x^2 - x$

EX: USING THE LIMIT DEFINITION, COMPUTE THE DERIVATIVE OF $f(x) = \frac{1}{x}$

Ex: PUT THE FOLLOWING IN ORDER: $f'(0), f'(1), f'(3), f'(5), f'(6)$

