## Math 111

## Chapter 2.7: Derivatives & Rates of Change

(DEFINITION) The derivative of a function f at a number a is:

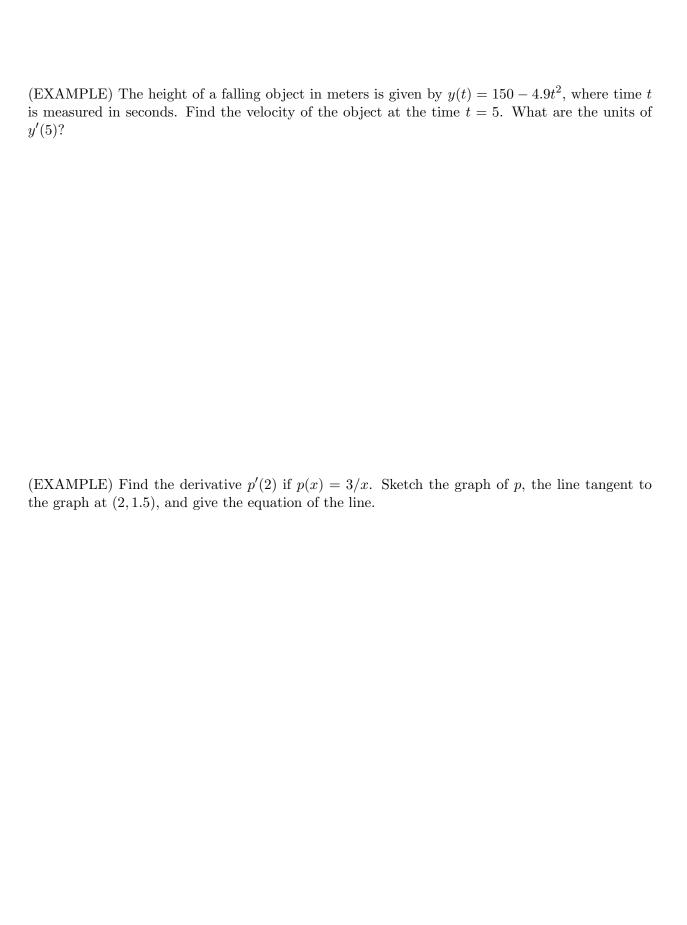
$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

The meaning of f'(a) is

1.

2.

(EXAMPLE) Find f'(9) if  $f(x) = 4 - \sqrt{x}$ . Sketch the graph of f and the tangent line at x = 9.



## (INTERPRETATIONS)

In certain circumstances, the volume of a gas is inversely proportional to the pressure. We could write volume as a function of pressure V(P) = k/P where k is a constant, V is measured in cm<sup>3</sup> and pressure measured in kPa.

- 1. What does V'(100) measure?
- 2. What is the sign of V'(100)?
- 3. What are the units V'(100)?
- 4. Which do you think is larger, V'(100) or V'(500)?

The garbage G produced by a city is a function of its population P. Suppose P is measured in thousands and G is measured in tons.

- 1. What does G'(250) measure?
- 2. What is the sign of G'(250)?
- 3. What are the units G'(250)?

Let A(t) represent the total mass of apples (in kg) you gather as a function of time you spend in an orchard (in hours).

- 1. What is the sign of A'(6)?
- 2. What are the units A'(6)?
- 3. Which do you think is larger A'(6) or A'(200)? Why?

Suppose we know that g is a continuous function with g(1) = 2, g'(1) = 0, g(4) = 0, and g'(4) = 1. Sketch a possible graph of g.