Warm-Up 0: units, vectors, and introductory calculus

Prof. Jordan C. Hanson

August 25, 2022

1 Chapter 1 - Units and Measurement

1. In your own words, what is a physics theory, and what determines the validity of a theory?

2. Which of the following is not correct?
   - A: The quantity meters per second^2 is a unit of acceleration.
   - B: A kilometer is a unit of speed.
   - C: A kilometer per hour is a unit of speed.
   - D: The quantity kg per meter^3 is a unit of density.

2 Chapter 2 - Vectors

1. Which of the following is should be considered a vector quantity (i.e. having a magnitude and direction)?
   - A: wind velocity
   - B: air temperature
   - C: the mass of an object
   - D: the brightness of a light source

2. Explain in your own words (or draw a diagram): why can't a vector have a component greater than its own magnitude?

3 Mathematics Topic - The Slope of a Function, with Units

1. The *slope*, m, of a function $f(t)$ between times t_i and t_f is defined as

$$m = \frac{f(t_f) - f(t_i)}{t_f - t_i} \tag{1}$$

2. Find the slope of the following function: $f(t) = 4t - 2$ meters, with $t_f = 4$ seconds and $t_i = 2$ seconds.

3. Find the slope of the following function: $f(t) = 2t^2 - 1$ meters, with $t_f = 3$ seconds and $t_i = 2$ seconds.