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

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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 Calculus Topic - The Derivative

1. The *derivative*, or slope of a function $f(t)$ is defined as

$$f'(t) = \lim_{dt \to 0} \frac{f(t+dt) - f(t)}{dt} \tag{1}$$

   What do you think the *limit* means, in your own words? Evaluate the limit: $\lim_{x\to\infty} \left(\frac{x}{1+x}\right)$.

2. Find the derivative of the following function: $f(t) = 4t - 2$.

3. (With professor): determine a procedure for taking the derivative of $f(t) = at^n + b$.