Vector Addition

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General Physics I Lab

211L - 01

Theory:

Vector, in physics, is a quantity that has both magnitude and direction. It is typically represented by an arrow whose direction is the same as that of the quantity and whose length is proportional to the quantity's magnitude. Although a vector has magnitude and direction, it does not have position. That is, as long as its length is not changed, a vector is not altered if it is displaced parallel to itself. In contrast to vectors, ordinary quantities that have a magnitude but not a direction are called scalars. For example, displacement, velocity, and acceleration are vector quantities, while speed (the magnitude of velocity), time, and mass are scalars.In contrast to vectors, ordinary quantities that have a magnitude but not a direction are called scalars. For example, displacement, velocity, and acceleration are vector quantities, while speed (the magnitude of velocity), time, and mass are scalars.

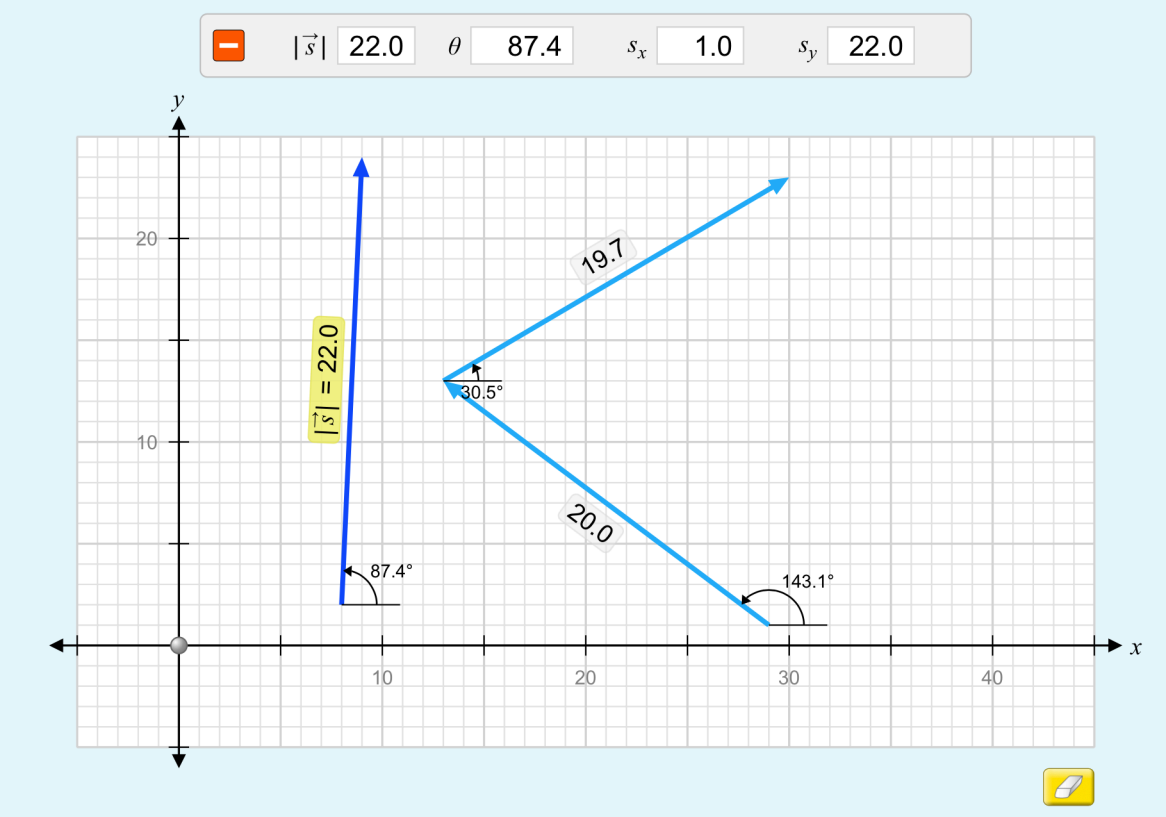
To qualify as a vector, a quantity having magnitude and direction must also obey certain rules of combination. One of these is vector addition, written symbolically as A + B = C (vectors are conventionally written as boldface letters). Geometrically, the vector sum can be visualized by placing the tail of vector B at the head of vector A and drawing vector C—starting from the tail of A and ending at the head of B—so that it completes the triangle. If A, B, and C are vectors, it must be possible to perform the same operation and achieve the same result (C) in reverse order, B + A = C. Quantities such as displacement and velocity have this property (commutative law), but there are quantities (e.g., finite rotations in space) that do not and therefore are not vectors.

Data Presentation and Calculations:

Graph 1:

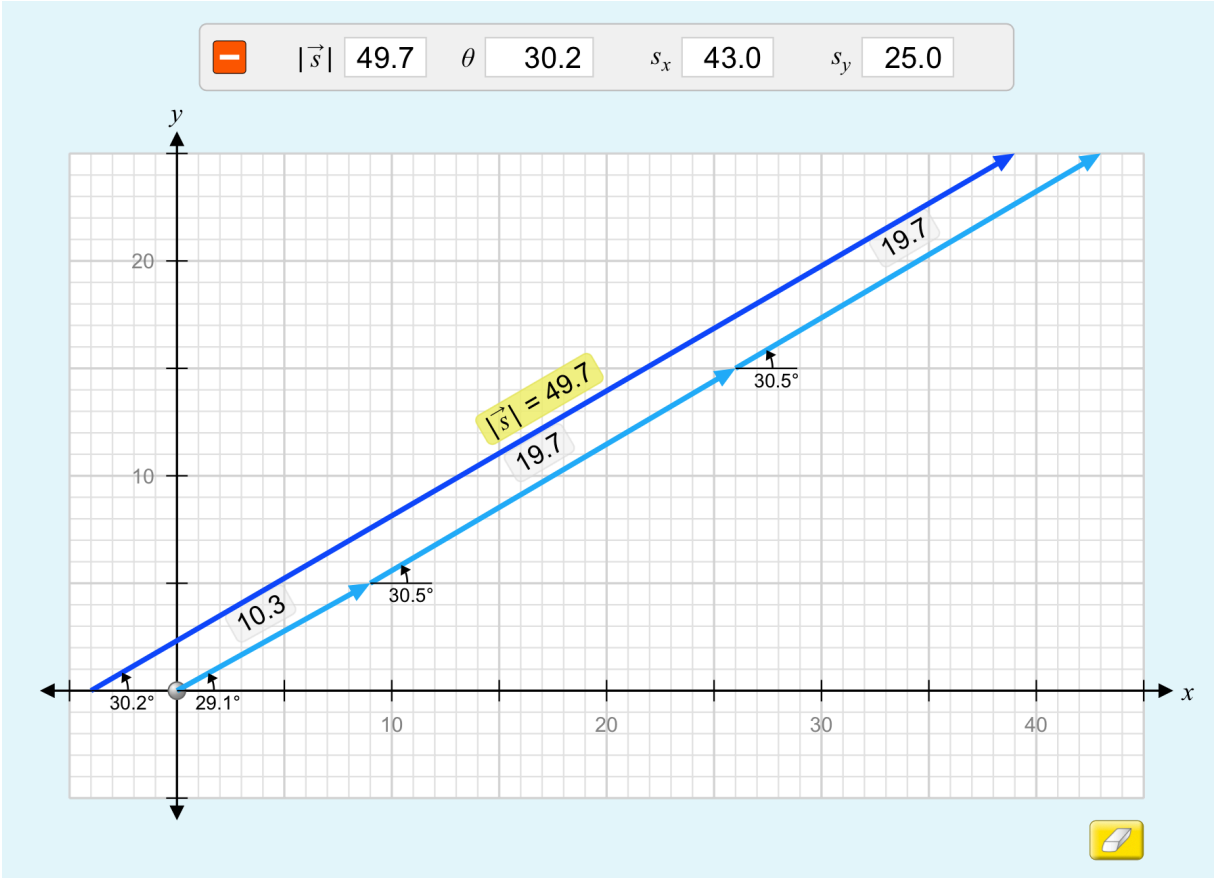
Adding vectors A + B: The values of these vectors were taken from the sample worksheet for the lab. Vector A has a length of 10.0 and an angle of 30º. The closest that I could get to those values using the vector addition simulator was a length of 10.3 and an angle of 29.1º. Vector B has a length of 5.0 and an angle of 53º. The closest that I could get to those values was a length of 5.0 and an angle of 53.1º. When added, the result of the sum of these vectors was equal to a length of 15.0 and an angle of 36.9 which is illustrated by the vector on top of vectors A and B.

Graph 2:



Subtracting vectors D - F: vector D has a length of 20.0 and an angle of 37º. The closest that I could get to those values was a length of 20.0 and an angle of 143.1 due to its orientation. Vector F has a length of 20.0 and an angle of 30º, since it's a subtraction it is presented in the opposite way as that presented in the sample worksheet. The closest that I could get to those values were a length of 19.7 and an angle of 30.5º. When subtracted the result is presented by the vector on the side of vectors D and F which gives us a length of 22.0 and an angle of 87.4.

Graph 3:



Adding vectors A + 2F: vector A has a length of 10.0 and an angle of 30º. The closest that I could get was a length of 10.3 and an angle of 29.1º. The two vectors F have a length of 20 and an angle of 30º. The closest that I could get was a length of 19.7 and an angle of 30.5º. When the three vectors are added the result is shown by the vector on top of vector A and the other two vectors f which gives us a length of 49.7 and an angle of 30.2º.

Conclusion:

When I added vectors A + B I got a vector with a length of 15.0 and an angle of 36.9. For the subtraction of vectors D - F I got a vector with a length of 22.0 and an angle of 87.4. For the addition of vectors A + 2F I got a vector with a length of 49.7 and an angle of 30.2º. Through the calculations of the equations that contained these vectors I was able to understand the addition and subtraction of vectors.

References:

(n.d.). Retrieved August 27, 2020, from https://webassign.net/question_assets/tamucalcphysmechl1/lab_2/manual.html

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