Chapter 3

Saturday, October 3, 2020 9:35 AM

I. 3-1: Vector and Scalars
   a. Vector: A object that has both magnitude and direction
   b. Scalar (Quantities): Quantities that are specified by numbers or units (mass, temperature, time, etc.)
II. 3-2: Addition of Vectors (Graphing)
   a. One Dimensional
      i. Finding resultant displacement: Simple Arithmetic
   b. Two Dimensional
      i. Finding resultant displacement: $D_{!} = D_{"} + D_{\#} + D_{\$}$ (Note that it's not magnitude but the vector itself)
      ii. Methods for showing resultant displacement
         1) Tail-to-tip Method: Adding the vectors to the previous vector
         2) Parallelogram Method: Adding the vectors to the starting point
III. 3-3: Subtraction of Vectors, and Multiplication of a Vector by a Scalar
   a. Negative Vectors: Vectors that go in the opposite direction
IV. 3-4: Adding Vectors by Components
   a. Vector Components: $V_{\%}$ represents the x-axis (scalar), $V_{\&}$ represents the y-axis (scalar)
   b. Finding $V_{\%}$, $V_{\&}$, θ or $V_{!}$ using SOH CAH TOA/Pythagorean Threoam
      i. $V_{\%} = \cos(\theta) \times V_{!}$
      ii. $V_{\&} = \sin(\theta) \times V_{!}$
      iii. $V_{!} = \sqrt{V_{\%}^{\#} + V_{\&}^{\#}}$
      iv. $\theta = \tan^{("}(\frac{V_{\&}}{V_{\%}})$
V. 3-5: Projectile Motion
   a. Finding the Peak Height
      i. Step 1: Finding what time the peak occurred at (using vertical component)
         1) Use $v_{\&} = v_{)} + gt$, solve for t
         2) Final Equation: $t = \frac{(*_{!}}{+}$ ($v_{\&}$ must be 0)
      ii. Step 2: Using time to find the peak height (using vertical component)
         1) Use $x = x_{)} + v_{)}t + \frac{"}{\#}gt^{\#}$, solve for x, substitute time from Step 1
         2) Final Equation: $x = x_{)} + v_{)}t + \frac{"}{\#}gt^{\#}$
   b. Finding total hang time
      i. Step 1: Solve for time (using vertical component)
         1) Use $x = x_{)} + v_{)}t + \frac{"}{\#}gt^{\#}$, solve for time
         2) Final Equation: $0 = \frac{"}{\#}gt^{\#} + v_{)}t + x_{)}$ (x must equal 0, this would require quadratic formula)
         $a = \frac{"}{\#}g$ (with no air resistance)
         $b = v_{)}$
         $c = x_{)}$ (most of the time will be 0)
   c. Finding total distance traveled
      i. Step 1: Solve for total time (using vertical component)
         1) See V.b.i
      ii. Step 2: Solve for distance traveled (using horizontal component)
         1) Use $x = x_{)} + v_{)}t + \frac{"}{\#}at^{\#}$, solve for x, substitute time from Step 1
         2) Final Equation: $x = x_{)} + v_{)}t$ (Acceleration is 0, which cancels $at^{\#}$)
   d. Calculating the vector after a certain amount of time
      i. Step 1: Finding the vertical component change (using vertical component)
         1) Use $v_{\&} = v_{)} + gt$, solve for $v_{\&}$
      ii. Step 2: Finding the magnitude of $V_{!}$
         1) Use $V_{!} = \sqrt{v_{\&}^{\#} + v_{\%}^{\#}}$, solve for $V_{!}$, substitute $v_{\&}$ with $v_{\&}$ from Step 1
      iii. Step 3: Finding the angle
         1) $\theta = \tan^{("}(\frac{V_{\&}}{V_{\%}})$
      iv. Final Answer:
         The vector magnitude is (answer from step 2) and it is (answer from step 3) degrees above the horizontal
VI. 3-6: Solving Problems Involving Projectile Motion
   a. See V.a-d
VII. 3-7: Projectile Motion is Parabolic
   a. The title of this section explains this section very clearly
VIII. 3-8: Relative Velocity
   a. Very similar to II