

Quadratic Formula in One Dimension

1. One of the equations of motion we will need to use frequently is $x = x_0 + v_0 t + \frac{1}{2} a t^2$, equation 2-11. Rewrite this equation by moving all quantities to the right-hand side, setting the left-hand side equal to zero.
2. You now have a quadratic equation. Rewrite the equation in the form $0 = At^2 + Bt + C$
3. What is the value of A? What is the value of B? What is the value of C?
4. Using the quadratic formula, $t = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$ solve the equation for t and simplify the result as much as possible.
5. Multiply both sides by the denominator of the right-hand side and simplify.
6. Another kinematics equation we will use is $v = v_0 + at$, equation 2-7. Solve this equation for at
7. Substitute this result in the equation in step 5.
8. Simplify the equation in step 7 as much as possible.
9. Square both sides of the equation in step 8.
10. Rewrite the equation in step 9 so that the minus sign preceding the 2 is a plus sign. What did you need to change? The result should be $v^2 = v_0^2 + 2a(x - x_0)$. You must show the steps you used.