Momentum Investigations Group 3

Investigations C and F

Investigation C: Does the impulse momentum theorem, $J = \Delta p$, hold true at an angle?

1) Control: flat surface
   a) Mass: 0.29879 kg
   b) $Velocity_{initial}$: 0.847 m/s
   c) $Velocity_{final}$: -0.771 m/s
   d) Impulse: -0.515 N*s

2) One book, firm bumper
   a) Mass: 0.29879 kg
   b) $Velocity_{initial}$: 0.637 m/s
   c) $Velocity_{final}$: -0.546 m/s
   d) Impulse: -0.457 N*s

3) One book, squishy bumper
   a) Mass: 0.29879 kg
   b) $Velocity_{initial}$: 0.693 m/s
   c) $Velocity_{final}$: -0.609 m/s
   d) Impulse: -0.471 m/s

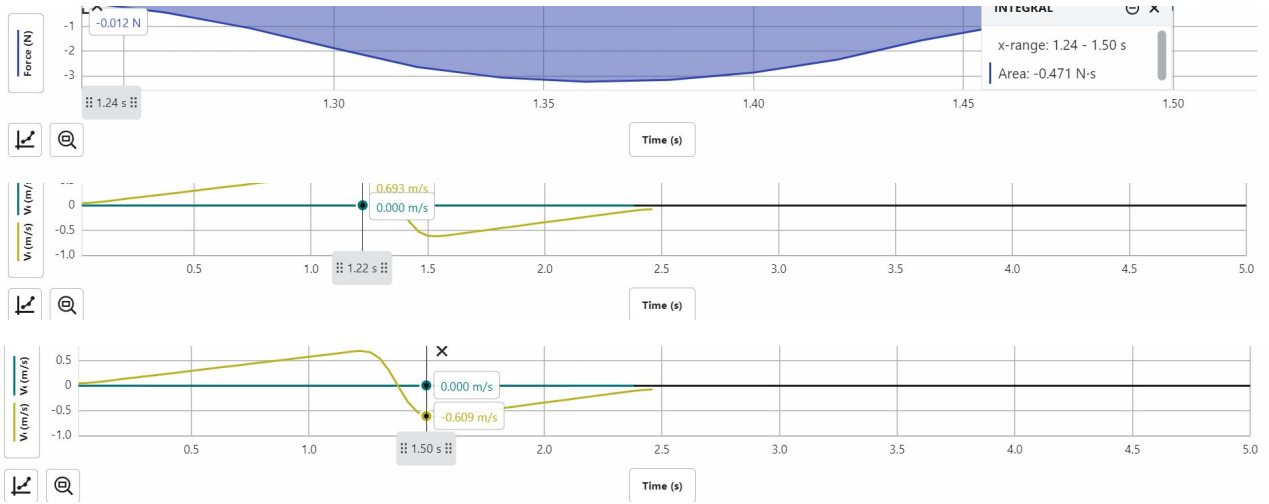


Figure 1: Squishy bumper example

Example Squishy Bumper Calculation:

$J = \Delta p$

$J = m * \Delta v$

$J = m * (v_{initial} - v_{final})$

$-0.471 = 0.29879 * (-0.609 - 0.693)$

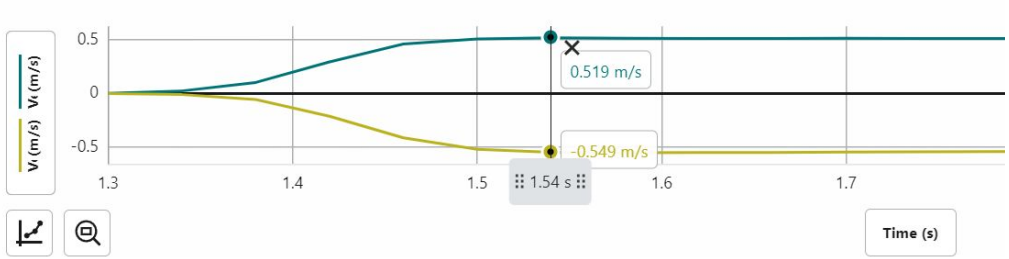
$-0.471 = -0.389$*

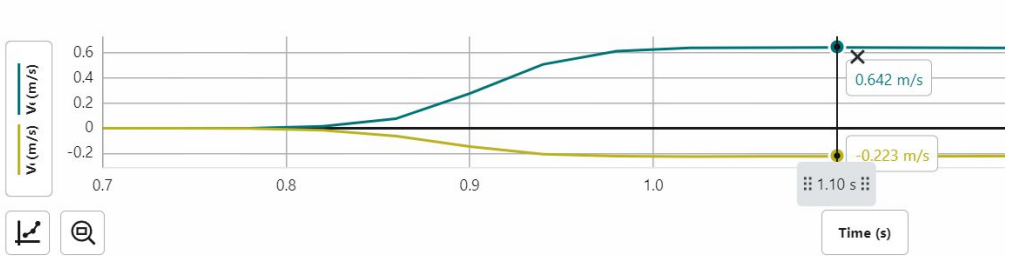
*not perfectly elastic due to gravity

Investigation F: Explosion

$KE = 1/2mv^2$

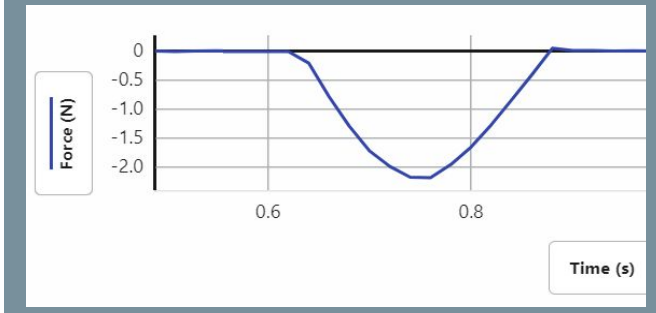
1) Control: Similar Masses
   a) Yellow Mass: 0.29879 kg
   b) Green Mass: 0.29900 kg
   c) $Velocity_{initial}$: 0 m/s
   d) $Velocity_{final}$: +/- 0.519 m/s
   e) $KE_{final} > KE_{initial}$
2) Increase mass of yellow cart
   a) Yellow Mass: 0.80276 kg
   b) Green Mass: 0.29900 kg
   c) Both $Velocity_{initial}$: 0
   d) Yellow $Velocity_{final}$: 0.233 m/s
   e) Green $Velocity_{final}$: -0.642 m/s
   f) $KE_{final} > KE_{inital}$





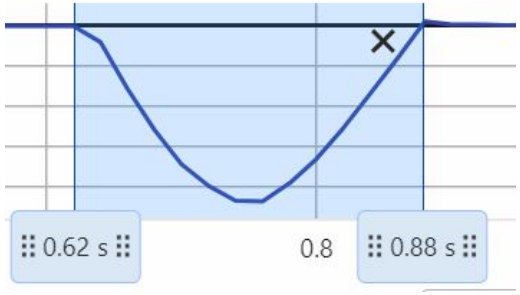
User Manual Feature: Apply Curve Fit

used to obtain equation for a section of data



Graph of force vs. time for cart hitting the bumper

If you need the equation of a section of data, the apply curve fit tool can give it to you:



Graph options

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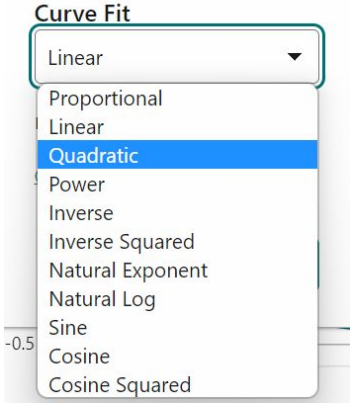
Apply curve fit



$y = 133.2x^2 + -199.9x + 72.99$