\[ F = -kx \]
\[ F = ma \]
\[ k = \frac{(m \times g)}{x} \]
\[ k = -\left(1\text{kg} \times 9.81\text{m/s}^2\right)/0.1\text{m} = -9.81\text{N}/0.1\text{m} = -98.1\text{N/m} \]
<table>
<thead>
<tr>
<th>Distance (m)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0865</td>
<td>0.1</td>
</tr>
<tr>
<td>0.1015</td>
<td>0.15</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>0.4416</td>
<td>0.0</td>
</tr>
<tr>
<td>0.4304</td>
<td>0.95</td>
</tr>
<tr>
<td>0.437</td>
<td>1.0</td>
</tr>
</tbody>
</table>
1) Trajectory given by, \( y = ax^2 + bx + c \)
   Peak of parabola occurs halfway between launch and target, call this \( x_{\text{Mid}} \)
   \( y_{\text{Peak}} = x \cdot x_{\text{Mid}}^2 + b \cdot x_{\text{Mid}} + c \)

2) Time to fall from \( y_{\text{Peak}} \) to target (height = 0), purely a function of acceleration due to gravity.
   \( t = \sqrt{\frac{2 \cdot y_{\text{Peak}}}{g}} \)

3) This is also the time time required to go from \( x_{\text{Mid}} \) to \( x_{\text{Max}} \). Can easily compute the average horizontal speed over that distance. If we assume no drag, that speed is horizontal speed at which projectile hits target.
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Peak of parabola occurs halfway between launch and target, call this $x_{Mid}$

$y_{Peak} = x^2 x_{Mid}^2 + b x_{Mid} + c$
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   Peak of parabola occurs halfway between launch and target, 
   call this \( x_{\text{Mid}} \)
   
   \( y_{\text{Peak}} = x \cdot x_{\text{Mid}}^2 + b \cdot x_{\text{Mid}} + c \)

2) Time to fall from \( y_{\text{Peak}} \) to target (height = 0), purely a function of acceleration due to gravity
   
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