

## The Bungee Jumper

<p>The original energy of the jumper is taken to be zero, and that must be the total energy of the jumper at each point on the way down. The jumper drops until the cord tightens. Up to this point the kinetic energy <math>E_k</math> gained equals the gravitational energy <math>E_g</math> lost. Since <math>E_g</math> is linear in <math>x</math>, then so is <math>E_k</math>. blue is <math>E_g</math> and red is <math>E_k</math>  <math>x=0</math> is the point at which the cord tightens</p>	
<p>Beyond <math>x=0</math>, the jumper's acceleration decreases until the equilibrium position where <math>mg=kx_e</math>. This is at the maximum of the upside down parabola. It must cut the <math>y</math> axis at the negative of the gravitational intercept. The final kinetic energy is zero.</p>	
<p>The elastic energy in red is summed together with the kinetic energy and the gravitational energy to give the magenta curve. The elastic energy is altered to ensure that the magenta curve becomes zero everywhere.</p>	
<p>Here all three curves add up to give zero for all values of <math>x</math>.  Summing just the kinetic and elastic energy curves gives the reflection of the gravitational energy, a straight line.</p>	

Ian Galloway

Copernican Revolutions