Graphical equation manipulator

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I stole a bunch of these from Phys1101.

1. EASY QUESTIONS

1.1. **Kid on a slide.** A kid goes down a infinitely slippery slide of height 2 ± 0.1m. How fast is he going when he gets to the bottom?

1.2. **Brick from building.** A brick takes 2.5s to fall from a height. How fast is it going when it hits the ground?

1.3. **Space shuttle murder.** You have been hired to check the technical correctness of an upcoming made-for-TV murder mystery. The mystery takes place in the space shuttle. In one scene, an astronaut's safety line is sabotaged while she is on a space walk, so she is no longer connected to the space shuttle. She checks and finds that her thruster pack has also been damaged and no longer works. She is 200 meters from the shuttle and moving with it. That is, she is not moving with respect to the shuttle. There she is drifting in space with only 4 minutes of air remaining. To get back to the shuttle, she decides to unstrap her 10-kg tool kit and throw it away with all her strength, so that it has a speed of 8 m/s. In the script, she survives, but is this correct? Her mass, including space suit, is 80 kg.

1.4. A horizontal spring-mass system has low friction, spring stiffness 190 N/m, and mass 0.6 kg. The system is released with an initial compression of the spring of 11 cm and an initial speed of the mass of 3 m/s. What is the maximum stretch during the motion? What is the maximum speed during the motion? Now suppose that there is energy dissipation of 0.03 J per cycle of the spring-mass system. What is the average power input in watts required to maintain a steady oscillation?

2. HARDER QUESTIONS

2.1. Orbit. With what velocity does the Earth orbit around the Sun, in terms of the mass of the Sun, the mass of the Earth, and the gravitational constant G? (It takes a year to orbit, obviously...)