

Related rates problems

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1. A child attempts a climbing wall in a gym. His father decided to just pull him to the top by hanging on to the end of the rope and walking away with it. If the rope is 32 ft. long, the pulley is 20 ft from the floor and the father holds the end of the rope 4 ft from the floor, while walking away at a speed of 3 ft/s, at what speed does the boy rise when his father is 12 ft away from the wall?
2. Sand falls from an overhead bin, accumulating in a conical pile with a radius that is always three times its height. If the sand falls from the bin at a rate of $120\text{ft}^3/\text{min}$, how fast is the height of the sandpile changing when the pile is 10ft high?
3. A tank of water in the shape of a cone is leaking water at a constant rate of $2\text{ft}^3/\text{hr}$. The base radius of the tank is 5 ft and the height of the tank is 14 ft.
 - a) At what rate is the depth of the water changing when the depth of the water is 6 ft?
 - b) At what rate is the radius of the top of the water in the tank changing when the depth of the water is 6 ft?
4. A 5 ft. tall woman walks at 8 ft/sec toward a street light that is 20 ft above the ground. What is the rate of change of the length of her shadow when she is 15ft from the street light? At what rate is the tip of her shadow moving?
5. At what rate is soda being sucked out of a cylindrical glass that is 6 in tall and has a radius of 2 in? The depth of the soda decreases at a constant rate of 0.25 in/s.