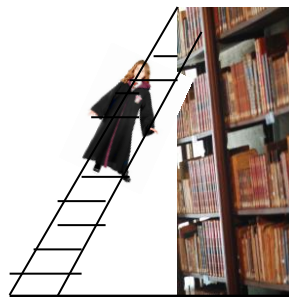


Derivative Applications Practice Test

1. Hermione is looking to climb a 17 foot ladder that is leaning against a rack of books. She needs to grab “A History of Hogwarts” book from the top shelf, but the ladder starts sliding away at a rate of 4 feet/sec. How fast is the top of the ladder sliding down the bookcase when the foot of the ladder is 8 feet from the bookcase.



2. The top cone of the Wicked Witches' Hourglass, which is counting down to Dorothy's death, has a diameter of 10 inches and a height of 12 inches. If the sand is 8 inches deep and sinking at a rate of 5 inches per hour, at what rate is the volume changing?



Wow, I wish I could solve this.
If I only had a brain.



3. Harry Potter is walking through Hogsmeade Village one fine evening, heading back to Hogwarts castle. Harry walks past a lamppost that is 20 feet tall at a constant rate of 4 feet per second. Recently enduring a growth spurt, Harry is now 6 feet tall.

a) Determine the rate at which Harry's shadow is lengthening when three seconds have passed since he walked by the light.

b) Determine the rate at which the tip of Harry's shadow is lengthening.



4. A farmer has 1000 ft of fencing and wants to fence off a rectangular field that borders a relatively straight river. He needs no fence along the river. He also needs to have the field divided by the fence into 2 sections so his animals don't eat his vegetables. What are the dimensions of the field that has the largest area?



5. UPS has contracted you to design an open-top rectangular box with a square base that has a volume of 10,000 cubic inches.

a) What dimensions yield the minimum surface area?

b) What is the minimum surface area?

6. Morpheus sells 1000 packages of sleeping pills every month at a price of \$12 per package. Suppose that for each \$1 increase in price, 10 less packages would be sold. At what price should Morpheus sell each package in order to maximize his revenue? Also, what would his maximum revenue be?