MATH 1030: Homework 10

due April 9, 2013

Instructions: Do the following problems on a separate sheet of paper. Show all of your work.

Problem 1

In 1977, Luke Skywalker saved planet Earth from certain destruction by exploiting a weakness in the Death Star and destroying it. According to Dodonna, the weakness was "a small thermal exhaust port, right below the main port." The shaft lead directly to the reactor system. The target was only 2 meters wide. Luke had a precise hit, which started a chain reaction that destroyed the station.

(a) If the exhaust port was square, what was its area?

(b) What was its perimeter?

Problem 2

The Death Star was a spherical shaped space-station and weapon of mass destruction approximately the size of our moon (radius $\approx 1,737$ km). The Death Star was used to destroy princess Leia's home planet of Alderaan, which had a population of 1.97 billion people.

The Vogon Constructor Fleet was a fleet of intergallactic spacecraft capable of travelling through hyperspace. They weree tasked with carrying out the Vogon's wishes and demolishing entire planets. In 2005, the Constructor Fleet destroyed earth, killing its population of 6.46 billion people (fortunately this occured in an alternate universe). The ships in the fleet were shaped like rectangular prisms (they "hung in the air in much the same way that bricks don't"). The ship that destroyed Earth had length $l = 5356$ km, width $w = 4000$ km, and height $h = 3500$ km.

(a) Find the surface area of the Death Star.

(b) Find the volume of the Death Star.

(c) Find the surface area of the Vogon Constructor that destroyed Earth.

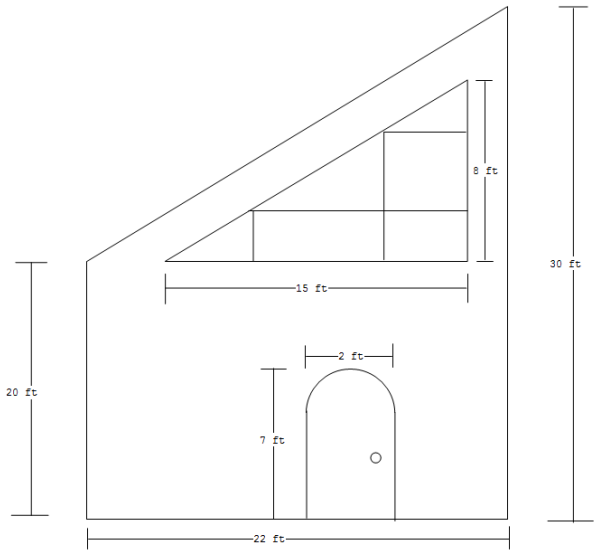
(d) Find the volume of the Vogon Constructor that destroyed Earth.

(e) Which had a higher murder to volume ratio, the Death Star or the Vogon Constructor?

(f) Which had a higher murder to surface area, the Death Star or the Vogon Constructor?

Problem 3

After destroying the Death Star, Luke mustered up the courage to quit the force and fulfill his lifelong dream of farming in the countryside. With his reward money, he had an upscale post-post-modern house built. The house is shaped as in the figure, with a large triangular window on the second story and a front door.



Luke got angry and fired the contractors building his house right before they finished.

(a) Find the area of the window so Luke knows how much windex to buy in order to clean it.

(b) Find the perimeter of the window so that Luke knows how much paint he needs to paint the trim around the window.

(c) Find the area of the front of the house (minus the door and the window) so Luke knows how much siding to buy.

(d) Find the perimeter of the front of the house so Luke knows how many feet of holiday lights to buy (the holidays are fast approaching).

Problem 4

Luke Skywalker doesn't have much use for his pal R2-D2 anymore. He noticed that R2-D2 looks like he would make a good trash can, but Luke already has a trash can. Both R2-D2 and Luke's current trash can are shaped like cylinders with hemispherical tops. The total height of the trash can is 36"(including the dome) and its radius is 12". R2-D2, on the other hand, has a diameter of 9". The cylindrical porttion of R2-D2 has a height of 30".

(a) Which one can hold more trash?

(b) Which one has more visible surface area (do not count the bottom circle)?