Math 113 Stretch 4

Spring 2023, Section 4, Mr. Joshua Siktar

March 6, 2023

1 Spheres [9 points]

a. Find the surface area of a sphere of radius 9.

b. Find the volume of a sphere of radius 4.

c. You have two spheres: one of radius r and one of radius $3r$. What is the ratio of the volumes of the two spheres?

2   Prisms [12 points]

a. Explain Cavalieri's Principle in your own words. Feel free to draw a picture or two if it helps with your explanation

b. Find the surface area and volume of a rectangular prism with side lengths $2, 5$, and 9. Make sure you label one answer as surface area and one as volume.

c. A triangular prism has a height of 15 inches and a volume of 335 cubic inches. What is the area of the cross-section of the prism?

d. In part c, do you have enough information to find the base and height of the triangular cross-section? Why or why not?

3   Divide and Conquer [10 points]

NOTE: these problems involve using multiple different area/volume formulas, and hence they will be a bit more time-consuming. Start by identifying what formulas you want to use for each problem, and write them down (this is a good rule of thumb for earning at least partial credit)

a. Determine the volume of a Christmas tree. The top is a pyramid with square base, where the square base has side length 20 inches, and the height is 48 inches. The stand for the tree is a rectangular prism with length 6 inches, width 10 inches, and height 24 inches. Include units in your answer.

b. My cold brew maker works as follows: you pour water into a cylinder to a height of 8 inches, diameter 5 inches. Then, you place the filter with the coffee grounds inside the bigger cylinder. The filter is a smaller cylinder with radius 1 inch and height 6 inches. What is the combined volume of the water and the filter?

After solving this problem, close the lid on the filter, shake it, and wait 24 hours for delicious cold brew!

There is no bonus problem on this assignment, but if you get a full 10 points on the last two problems, I'll add two extra points to your final score, so take your time on these.