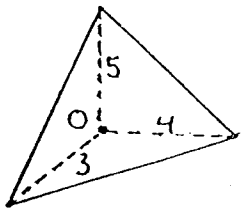
Math 21B
Kouba
Discussion Sheet 9

1.) A drill of radius 3 inches bores a hole through a hemispherical solid of radius 5 inches. If the drill bores a hole perpendicularly to and symmetrically about the center of the flat circular base, what is the volume of what remains of the hemisphere ?

2.) Determine the volume of the given four-sided block. Assume that the three triangles meeting at point O are right triangles.



3.) Consider region R bounded by the graphs of $y = 3x$, $y = x$, and $x = 1$.

a.) Compute the area of R.

b.) Use the DISC METHOD (set up only) to find the volume of the solid formed by revolving R about the

i.) x-axis. ii.) y-axis. iii.) line y = 4. iv.) line x = -1.

c.) Repeat part b.) using the SHELL METHOD.

4.) A flat plate in the shape of an isosceles right triangle with legs 3 ft. long weighs 18 lbs. and has uniform density. Find the kinetic energy (set up only) of the plate if it spins 15 times per second about its hypotenuse.

5.) Use integration to DERIVE the formula for the volume of a right circular cone of radius r and height h.

6.) Consider region R bounded by the graphs of $x = y^2$ and $x = y^3 - y^2$.

a.) Find the area of R.

b.) Find the volume of the solid formed by revolving R about the

i.) x-axis. ii.) line x = -2.

7.) Find the centroid of the region bounded by the graphs of $y = x^4$ and $y = x^5$.

8.) Consider the region R below the graph of $y = \dfrac{1}{x}$ and above the x-axis on the interval $[1, \infty)$.

a.) Determine if R has finite or infinite area.

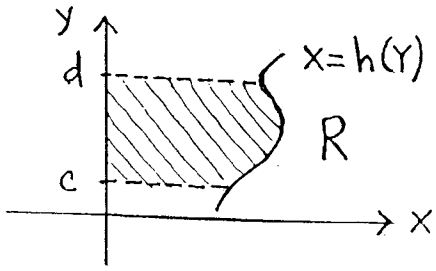
b.) Form a solid by revolving R about the x-axis. Determine if the resulting volume is finite or infinite.

9.) Compute the following improper integrals.

a.) $\displaystyle\int_1^{\infty} \frac{1}{x(x+4)}\,dx$ b.) $\displaystyle\int_{-\infty}^{0} e^{3x}\,dx$ c.) $\displaystyle\int_{-1}^{\infty} \frac{1}{\sqrt{x+1}}\,dx$

d.) $\displaystyle\int_{-\infty}^{\sqrt{3}} \frac{1}{x^2+9}\,dx$ e.) $\displaystyle\int_1^{e^2+1} \frac{7}{x-1}\,dx$

10.) Consider the region R given in the diagram at right. If the volume of the solid formed by revolving R about the y-axis is 10π and the volume of the solid formed by revolving R about the line x = -1 is 20π, what is the area of R ?



" I hear and I forget. I see and I remember. I do and I understand."– Chinese Proverb