Problem Set #16

Due: Thursday, 2 February 2012

1. Decide which of the following improper integrals converge.

(a) $\displaystyle\int_0^{\pi/2} \frac{\cos(x)}{1-\sqrt[3]{\sin(x)}}\,dx$

(b) $\displaystyle\int_1^{\infty} \frac{\sin(t)}{t}\,dt$

2. Find the volume of the torus obtained by rotating the circle $(x-a)^2+y^2=b^2$ where $a>b$ around the y-axis.

3. The curve $y=\sin(x)$ where $0 \leqslant x \leqslant \pi$ is revolved about the line $y=c$ where $0 \leqslant c \leqslant 1$ to generated a solid.

(a) Find a value of c that minimizes the volume of the solid. What is the minimum volume?

(b) What value of c in $[0,1]$ maximizes the volume of the solid?