

Spring 2005 Math 152
Exam 1A: Extras
Mon, 21/Feb ©2005, Art Belmonte

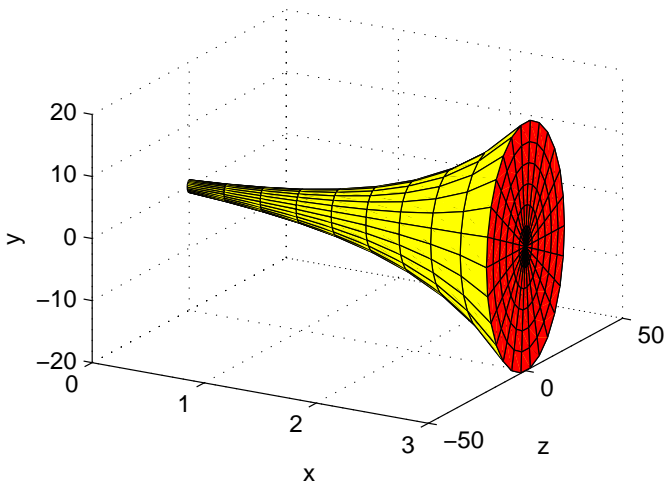
Selected Three-Dimensional Plots

All plots were rendered with **MATLAB**.

Problem 5

Here is a 3-D plot of the solid of revolution.

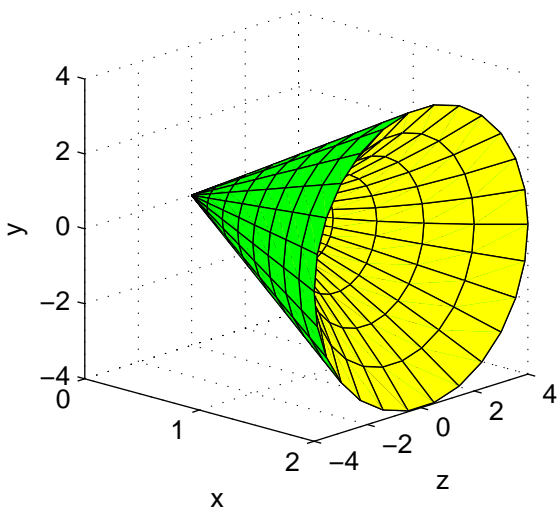
X1A/5: 3-D picture of solid



Problem 9

Here is a 3-D plot of the solid of revolution.

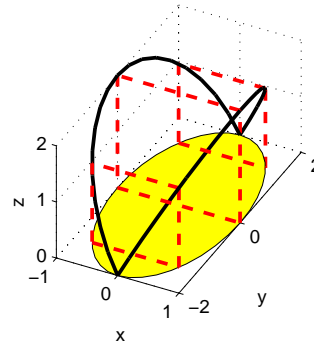
X1A/9: 3-D picture of solid



Problem 12

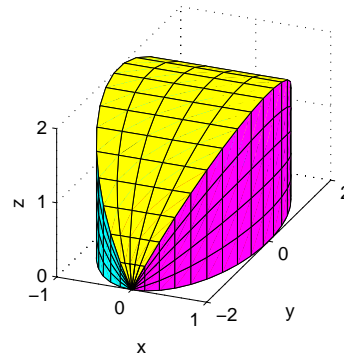
Here is a picture of the solid showing its elliptical base, its two upper edge boundaries, and a few square cross-sections.

X1A/12: 3-D picture of solid



Here's another plot showing the surface patches (faces) of the solid. Clearly, this is NOT a solid of revolution!

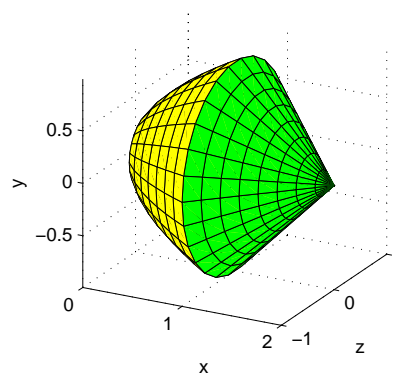
X1A/12: 3-D picture of solid



Problem 13

Here is a 3-D plot of the solid of revolution.

X1A/13: 3-D picture of solid



(Turn the page for an alternative solution to Problem 13.)

Problem 13 via disks instead of shells

If one used cylindrical shells, then the volume involves computing *one* integral, as shown in the main solutions.

Many if not most students did this problem via disks instead. Note that while this method gets the job done, one must evaluate *two* integrals.

$$\begin{aligned} V &= \int_a^b \pi r^2 dx + \int_b^c \pi r^2 dx \\ &= \int_0^1 \pi (\sqrt{x})^2 dx + \int_1^2 \pi (2-x)^2 dx \\ &= \pi \int_0^1 x dx + \pi \int_1^2 (x-2)^2 dx \\ &= \left. \left(\frac{1}{2} \pi x^2 \right) \right|_0^1 + \left. \left(\frac{1}{3} \pi (x-2)^3 \right) \right|_1^2 \\ &= \left(\frac{1}{2} \pi - 0 \right) + \left(0 - \left(-\frac{1}{3} \pi \right) \right) \\ &= \frac{5}{6} \pi \approx 2.62 \text{ cm}^3 \end{aligned}$$