MATH 31, LECTURE 10

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For emphasis:

To calculate volumes:

(1) Draw the picture (very important!!!!). Can you "fill the solid" with parallel discs/washers/(other cross-sections with easily-computable areas)? Can you "fill the solid" with cylindrical shells?
(2) Washers: Find the inner radius and outer radius for each washer. (If the inner radius is zero, it's a disc.) Shells: Find the radius, circumference, and height.
(3) Use the formula to set up the integral. (Hopefully you will get to the point where you don't have to memorize the formula–it just makes sense.)
(4) Evaluate the integral.

Example. The region bounded by $x = 0$, $y = 0$, $y = \cos x$ for $0 \leq x \leq \frac{\pi}{2}$, rotated about the y-axis. Set up the integral for the volume. Using Integration by Parts (§7.1) we find that, using the washer method or the shell method, the volume is $\pi^2 - 2\pi$.

Someone asked about the problem

$$\int_0^1 x\sqrt{1-x^4}\,dx$$

from Section 5.5.

Evil Test Question. Evaluate the integral

$$\int_0^1 (x+1)^{12}\,dx.$$

The easiest way is to use the Chain Rule/ the Substitution Rule.

I also answered other questions; I don't remember what exactly.