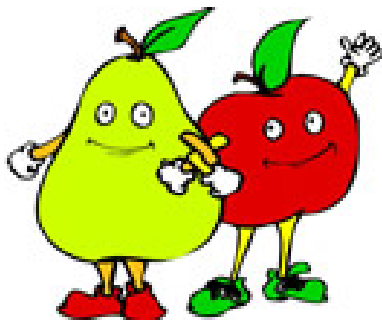


# Math 213 Quiz # 1 solutions

The apple and pear: together again

January 25, 2008



*Hi everyone. We, the apple and pear, have put aside our differences about which fruit is better and have come together to write your quiz # 1 solutions. We hope that this worksheet helps. We note that several people attempted to try to fit things into the disk method, and by doing this, they inadvertently set up the problem to go about a different axis! So look carefully at these solutions and we hope that it helps you study for the test! ROCK ON!*

1. We use the disk (washer) method with  $R = x^2$ , and  $r = x^3$ . We see that the region is defined between the curves given, and that they bound this region between  $x = 0$  and  $x = 1$ . The volume is

$$\begin{aligned}\pi \int_0^1 ((x^2)^2 - (x^3)^2) dx &= \pi \int_0^1 x^4 - x^6 dx \\ &= \pi \left[ \frac{1}{5} x^5 - \frac{1}{7} x^7 \right]_0^1 \\ &= \pi \left( \frac{1}{5} - \frac{1}{7} \right) \\ &= \frac{2\pi}{35}.\end{aligned}$$

2. Since the region has a portion taken out of it as you travel horizontally, it seems much harder to describe the washers needed in an effort to compute such a volume. Thus, for our fruity kind, we agree that the shell method is probably more efficient.
3. We use the shell method. Notice that the curves bound the region between  $x = 0$

and  $x = 2$ . Thus we have the volume as

$$\begin{aligned} 2\pi \int_0^2 x((4x - x^2) - x^2)dx &= 2\pi \int_0^2 x(4x - 2x^2)dx \\ &= 2\pi \int_0^2 4x^2 - 2x^3 dx \\ &= 2\pi \left( \frac{4}{3}x^3 - \frac{1}{2}x^4 \right) \Big|_0^2 \\ &= 2\pi \left( \frac{32}{3} - 8 \right) \\ &= 2\pi \frac{8}{3} \\ &= \frac{16\pi}{3}. \end{aligned}$$