MTH 32 LECTURE NOTES (Ojakian)

Topic 3: Volumes

OUTLINE

(References: 2.2, 2.3)

1. Finding volumes using cross-section function

2. Finding volumes of rotation:

   (a) Disks

   (b) Shells

---

1. <u>Volumes: Slicing (i.e. Cross Sections)</u>

   PROBLEM 1. *From* WORK BOOK *do section 3: Exercise 4.*

   PROBLEM 2. *Find the volume of the following 3D structure: The base is a right triangle (base and height some constant c) on the yz plane, with height 2, extending along the x-axis (do it using calculus and not).*

   Do the problem again, but now with height and base = x.

2. <u>Volumes of rotation: Disk Method</u>

   (a) Note: Involves finding cross section ourselves.

   PROBLEM 3. *Find the volume of the solid obtained by rotating the following region about the x-axis: the region under the curve $y = \sqrt{x}$ from 1 to 4.*

   Do the problem again, but now the region goes down to the line $y = -1$ and rotate about that line.

   (b) Examples

   PROBLEM 4. *From* WORK BOOK *(section 3) do: exercies 7, 9*

   (as a challenge: do 8)

3. <u>Volumes of rotation: Shells</u>

   PROBLEM 5. *From* WORK BOOK *(section 4): Exercise 2 - and think of two ways to find the area of a cylindrical shell - exact and by approximation.*

   PROBLEM 6. *From* WORK BOOK *(section 4): Exercise 5*

4. <u>Volumes: Choose your method!</u>

PROBLEM 7. *(Conceptual Practice)*

For each picture on the board do the following:

- *Slicing or Rotation?*
- *If rotation: Disk or Shell?*
- *Draw a representative rectangle.*
- *Draw the radius.*
- *Setup the volume as a limit of Riemann Sums.*
- *Set-up the integral that computes the volume.*

PROBLEM 8. *From the* WORK BOOK *(section 3): do exercise 10.*

PROBLEM 9. *From* WORK BOOK *do section 3: Exercise 5 (volume of a sphere)*

PROBLEM 10. *Consider the graph of $y = 2x + 1$ and find the volumes of for various rotations.*

PROBLEM 11. *From the* TEXTBOOK *(section 2.3, page 166), Exercises:*

141 (and try region from $x = 0$ to $x = 3$)

144

153