Slicing with area and volume

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1) Easy: Calculate the area of the semicircle $x^2 + y^2 \leq 1$ with $y \geq 0$. Do this using slices parallel to the x-axis. Draw a picture to see the slices and where they are.

Harder: Calculate the volume of the half sphere $x^2 + y^2 + z^2 \leq 1$ with $z \geq 0$. Do this using slices parallel to the xy-plane. Draw a picture to see the slices and where they are.

Hardest: Calculate the volume of the half sphere $x^2 + y^2 + z^2 \leq 1$ with $z \geq 0$. Do this using slices parallel to the yz-plane. Draw a picture to see the slices and where they are.

2) Easy: Calculate the area of the semicircle $x^2 + y^2 \leq 1$ with $y \geq 0$. Do this using slices parallel to the y-axis. Draw a picture to see the slices and where they are.

Harder: Calculate the volume of the half cylinder $x^2 + y^2 \leq 1$ in space with $0 \leq z \leq 2$ and $y \geq 0$. Do this using slices parallel to the xy-plane. Draw a picture to see the slices and where they are.

Hardest: Calculate the volume of the half cylinder $x^2 + y^2 \leq 1$ in space with $0 \leq z \leq 2$ and $y \geq 0$.. Do this using slices parallel to the yz-plane. Draw a picture to see the slices and where they are.

3) Easy: Calculate the area of a triangle with vertices at $(-2, 0)$, $(2, 0)$, $(0, 3)$. Do this using slices parallel to the y-axis. Draw a picture to see the slices and where they are.

Harder: Calculate the volume of a pyramid whose base is a square of side length 4 and whose apex is above the center of the square a distance 5 from the base. Do this using slices parallel to the base. Draw a picture to see the slices and where they are.

Hardest: Calculate the volume of a pyramid whose base is a square of side length 4 and whose apex is above the center of the square a distance 5 from the base. Do this using slices perpendicular to the base. Draw a picture to see the slices and where they are.

4) Easy: Calculate the area of a triangle with vertices at $(-2, 0)$, $(2, 0)$, $(0, 3)$. Do this using slices parallel to the x-axis. Draw a picture to see the slices and where they are.

Harder: Calculate the volume of a right triangular prism whose base is the triangle in the previous part and whose height is 5 units (so the prism is bounded by 3 rectangles and two triangles). Do this using slices parallel to the base. Draw a picture to see the slices and where they are.

Hardest: Calculate the volume of a right triangular prism whose base is the triangle in the previous part and whose height is 5 units (so the prism is bounded by 3 rectangles and two triangles). Do this using slices parallel to one of the rectangular sides. Draw a picture to see the slices and where they are.

5) Easy: Calculate the area of the region bounded by the curve $y = \sqrt{x}$, the x-axis, and the line $y = 3$. Do this using slices parallel to the x-axis. Draw a picture to see the slices and where they are.

Harder: Calculate the volume of the solid formed by rotating this region around the x-axis in space. Do this using slices perpendicular to the x-axis. Draw a picture to see the slices and where they are.

Hardest: Calculate the volume of a solid formed by taking the base as the region in the first part of the problem and then making the cross-sections perpendicular to the x-axis squares. Draw a picture of the volume and show the slices and where they are.