0B. Volume of Revolutions. Let's say we revolve some region in the $xy$-plane around an axis of revolution so we get a solid of revolution. Next we want to find the volume of this solid of revolution.

- In parts a, fill in the blanks with: $x$ or $y$.
- In parts b and c, fill in the blanks with a formula involving some of: $2$, $\pi$, radius, $\text{radius}_{\text{big}}$, $\text{radius}_{\text{little}}$, average radius, height, and/or thickness.

▷ Disk/Washer Method. Let's find the volume of this solid of revolution using the disk or washer method.

a. If the axis of revolution is:
   - the $x$-axis, or parallel to the $x$-axis, then we partition the $x$-axis.
   - the $y$-axis, or parallel to the $y$-axis, then we partition the $y$-axis.

b. If we use the disk method, then the volume of a typical disk is:

\[
\pi \ (\text{radius})^2 \ (\text{height})
\]

If we use the washer method, then the volume of a typical washer is:

\[
\pi \ (\text{radius}_{\text{big}})^2 \ (\text{height}) - \pi \ (\text{radius}_{\text{little}})^2 \ (\text{height}) \quad \text{or} \quad \pi \ [\ (\text{radius}_{\text{big}})^2 - (\text{radius}_{\text{little}})^2 \ ] \ (\text{height})
\]

c. If we partition the $z$-axis, where $z$ is either $x$ or $y$, the $\Delta z = \text{height}$.

▷ Shell Method. Let's find the volume of this solid of revolution using the shell method.

a. If the axis of revolution is:
   - the $x$-axis, or parallel to the $x$-axis, then we partition the $y$-axis.
   - the $y$-axis, or parallel to the $y$-axis, then we partition the $x$-axis.

b. If we use the shell method, then the volume of a typical shell is:

\[
2\pi \ (\text{average radius}) \ (\text{height}) \ (\text{thickness}) \quad \text{or} \quad 2\pi \ (\text{radius}) \ (\text{height}) \ (\text{thickness})
\]

c. If we partition the $z$-axis, where $z$ is either $x$ or $y$, the $\Delta z = \text{thickness} \quad \text{or} \quad \text{radius}_{\text{big}} - \text{radius}_{\text{little}}$. 

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