Volume with Known Cross-Section Activity

AP Calculus BC | **Mr. Wille**
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1. With your group, make the following decisions about the solid that you will construct. (Circle your choice.)

Base Region	Cross-Section Shape	Orientation of Cross-Sections
Triangle Semi-Circle Quarter-Circle	Square Rectangles Equilateral Triangle Right Isosceles Triangle Semi-Circle	Perpendicular to x-axis Perpendicular to y-axis

2. Using double-sided tape, attach your base region to a piece of cardboard.
3. Using the correct orientation, measure the length of the base of your base region. This will be the base length of your cross-section.
4. Cut out your cross-section shape from the cardboard. Place the cross-section on the base and measure the next base-length. (You can speed up this process by using a piece of cardboard as a template. This way you can measure several base-lengths at once and divide the task of cutting the cross-sectional shapes.)
5. Glue the cross-sectional pieces together as you go. You want enough so that they will stick, but not so much that it takes a long time to dry. Rubbing the pieces together gently helps spread the glue.
6. Record your measurements in the table as you go along. (Only base-length measurement column.)

	Base-Length	Base-Length (unitless)	Cross-Section Area	Cross-Section Width	Cross-Section Width (unitless)	Volume of Cross-Section
1						
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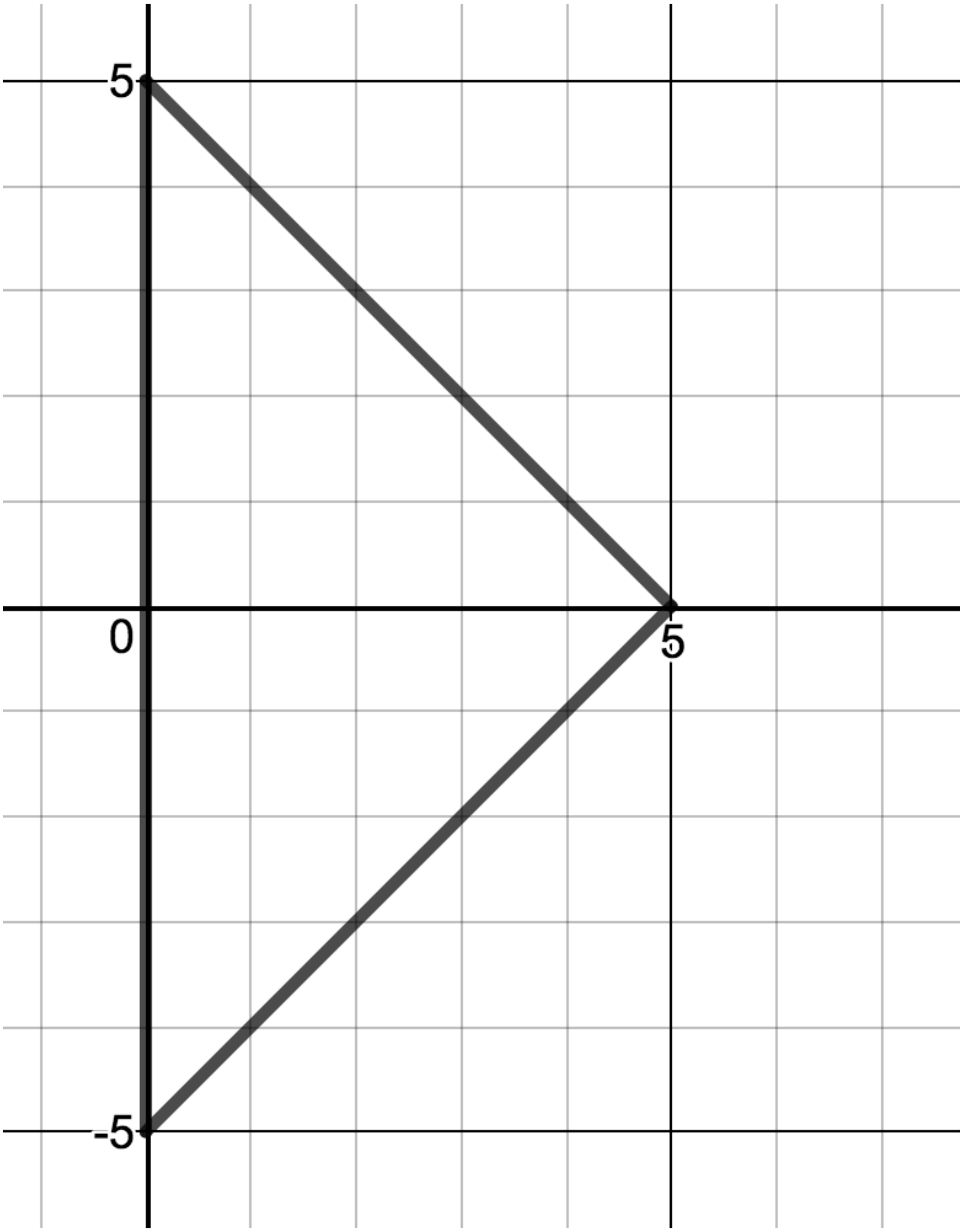
40						

7. Find the scale-factor between the units that you used to measure and the units on the graph of your base region. Use this to fill out the unitless base length column.
8. Compute the area of each cross section in terms of s, the unitless base length. Use this to fill out the cross-section area column.
9. Measure the width of each cross-section – or – measure the width of several cross-sections and divide to find the average width of each cross section.
10. Use your scale factor to fill out the unit-less width column.
11. Compute the volume of each cross section.
12. Add the volume of each cross-section to determine the volume of the entire solid.
13. Find the equations of the line(s) that determine your base region.
14. Use the formula $V = \int_a^b A(x)dx$ or $V = \int_a^b A(y)dy$ to determine the exact volume of the solid that your model is approximating. How close did you get?
15. Propose a method for creating a model that more accurately approximates the volume you found in question 14.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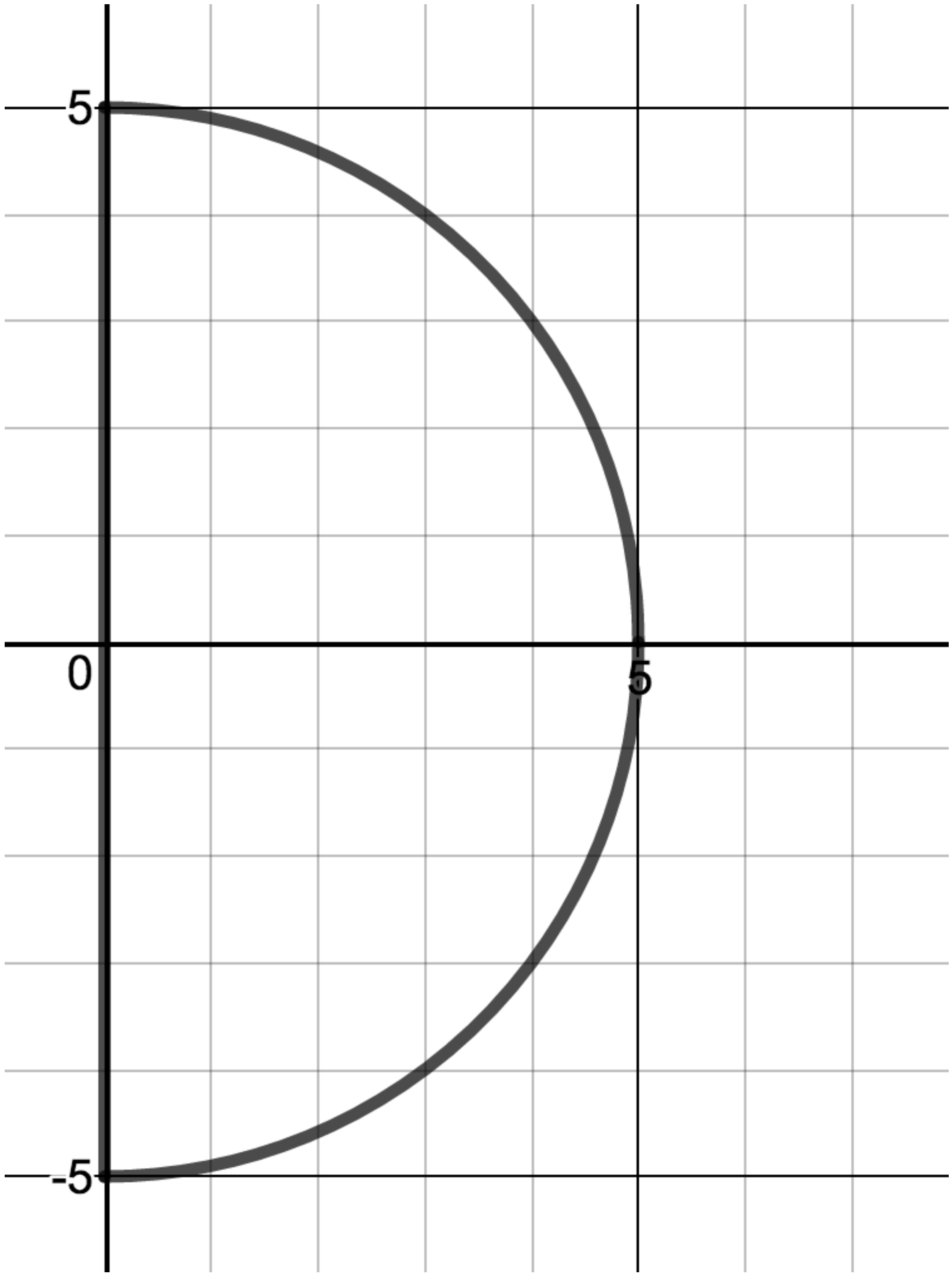

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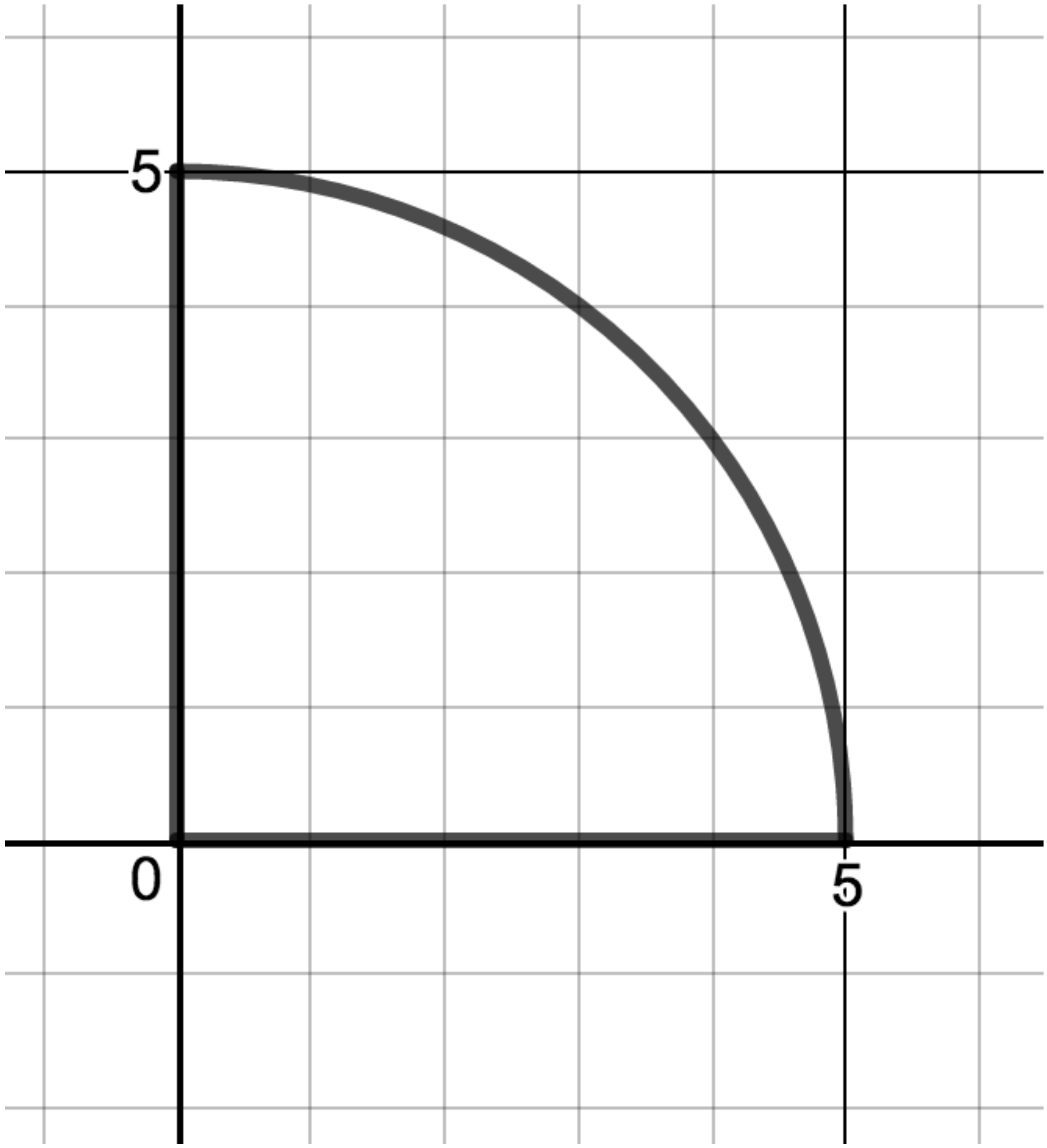
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