AP Calculus
Notes/Classwork: Volume of Cross Sections

Name____
Partner____________________Day 3 & 4 App Integration

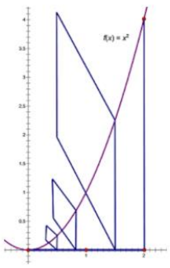
$\int circumference\ of\ a\ Circle = \int 2\pi r =$

$\int surface\ area\ of\ sphere = \int 4\pi r^2$

$\int Area\ of\ Cross\ Section =$	
$cross\ \ sections \perp to\ x\ then\ side =$	$cross\ \ sections \perp to\ y\ then\ side =$

Cross section is Square

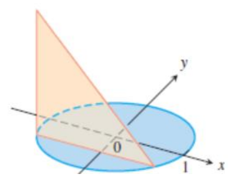
$\int Area\ of\ Square =$



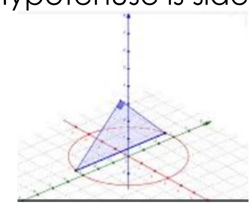
Cross Section is Isosceles Right Triangle

$\int Area\ of\ Isoceles\ Rt\ \Delta =$

Leg is side

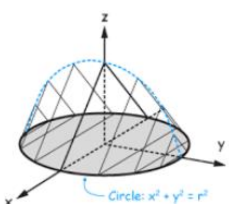


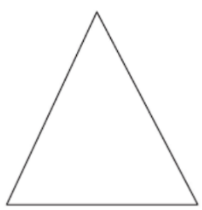
Hypotenuse is side



Cross Section is Equilateral Triangle

$\int Area\ of\ Equilateral\ \Delta =$

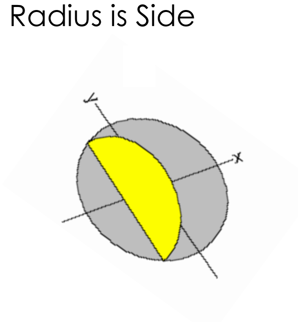




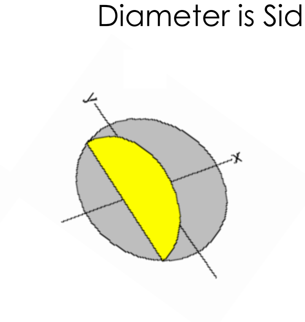
Cross Section is Semicircle

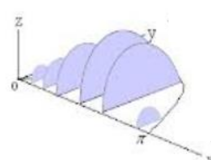
$\int Area\ semi\ circle =$

Radius is Side



Diameter is Side





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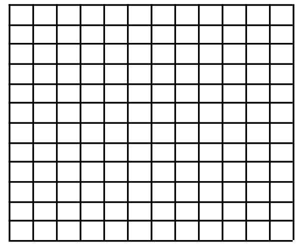


Base: $y = -\frac{1}{3}x + 4$

$y - axis\ \ (x = 0)$

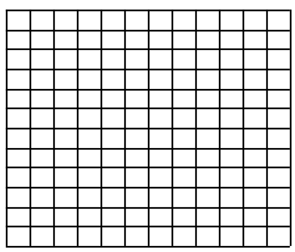
$x - axis\ \ (y = 0)$

1. Perpendicular to $x - axis$
   Cross Sections Squares

2. Perpendicular to $y - axis$
   Cross Sections Isosceles Right Triangles with leg on base.

3. Perpendicular to $x - axis$
   Cross Sections Equilateral Triangles

4. Perpendicular to $y - axis$
   Cross Sections Semi-Circles



Base: $y = \frac{1}{2}x^2$

$y = -x^2 + 6$

5. Perpendicular to $x - axis$
   Cross Sections Squares

6. Perpendicular to $y - axis$
   Cross Sections Isosceles Right Triangles with leg on base.

7. Perpendicular to $x - axis$
   Cross Sections Equilateral Triangles

8. Perpendicular to $y - axis$
   Cross Sections Semi-Circles

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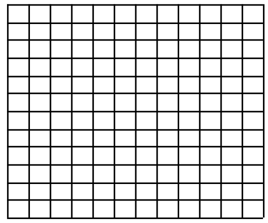
Base: $y = 4\sin\left(\frac{1}{2}x\right)$

$y = x^2 - 6x$



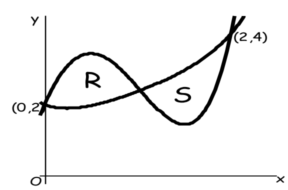
9. Perpendicular to $x-axis$
   Cross Sections Squares

10. Perpendicular to $x-axis$
    Cross Sections Isosceles Right Triangles with leg on base

11. Perpendicular to $x-axis$
    Cross Sections Equilateral Triangles

12. Perpendicular to $x-axis$
    Cross Sections Semi-Circles

13. Let f and g be the functions defined by $f(x) = 1 + x + e^{x^2-2x}$ and $g(x) = x^4 - 6.5x^2 + 6x + 2$ let R and S be the two regions enclosed by the graphs of f and g shown in the figure to the right.



Region S is the base of a solid whose cross sections perpendicular to the x-axis are squares. Find the volume of the solid.

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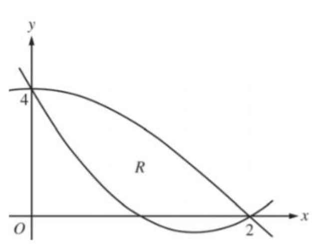
14. Let $f(x) = 2x^2 - 6x + 4$ and $g(x) = 4\cos\left(\frac{1}{4}\pi x\right)$. Let R be the region bounded by the graphs of f and g, as shown in the figure.



The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a square. Write, but do not evaluate, an integral expression that gives the volume of the solid.

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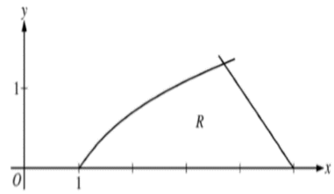
15. Let R be the region in the first quadrant bounded by the x-axis and the graphs of $y = \ln x$ and $y = 5 - x$, as shown in the figure to the right.



Region R is the base of a solid. For the solid, each cross section perpendicular to the x-axis is a square. Write, but do not evaluate, an integral expression involving one or more integrals that gives the volume of the solid.

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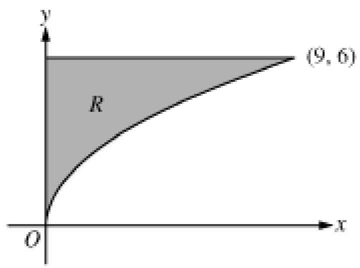
16. Let R be the region in the first quadrant bounded by the graph of $y = 2\sqrt{x}$, the horizontal line $y = 6$, and the y-axis, as shown in the figure to the right.



Region R is the base of a solid. For each y, where $0 \le y \le 6$, the cross section of the solid taken perpendicular to the y-axis is a rectangle whose height is 3 times the length of its base in region R. Write, but do not evaluate, an integral expression that gives the volume of the solid.

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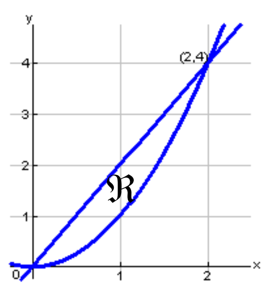
17. Let $\Re$ be the region in the first quadrant enclosed by the graphs of $y = 2x$ and $y = x^2$, as shown in the figure to the right.



Find the region $\Re$ is the base of a solid, at each x the cross section perpendicular to the $x-axis$ has area $A(x) = \sin\left(\frac{\pi}{2}x\right)$. Find the volume of the solid.

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18. The base of a solid is the region enclosed by $y = \sin x$ and the x-axis on the interval $[0,\pi]$. Cross sections perpendicular to the x-axis are semicircles with diameter in the plane of the base. Write an integral that represents the volume of the solid.

(A) $\frac{\pi}{8}\int_0^{\pi}(\sin x)^2\,dx$

(B) $\frac{\pi}{8}\int_0^{1}(\sin x)^2\,dx$

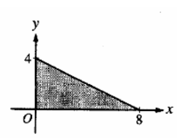
(C) $\frac{\pi}{4}\int_0^{\pi}\sin x\,dx$

(D) $\frac{\pi}{8}\int_0^{\pi}(\sin x)^2\,dx$

(E) $\frac{\pi}{2}\int_0^{\pi}(\sin x)^2\,dx$

19. The base of a solid is a region in the first quadrant bounded by the x −axis, y −axis, and the line $x + 2y = 8$, as shown in the figure. If the cross sections of the solid perpendicular to the x −axis are semicircles, what is the volume of the solid?

(A) 12.566
(B) 14.661
(C) 16.755
(D) 67.021
(E) 134.041



20. The base of a solid is the region in the first quadrant bounded by the y −axis, the graph of $y = tan^{-1}x$, the horizontal line $y = 3$, and the vertical line $x = 1$. For this solid, each cross section perpendicular to the $x - axis$ is a square. What is the volume of the solid?

(A) 2.561
(B) 6.612
(C) 8.046
(D) 8.755
(E) 20.773