Calculus Lesson #1 Unit 11

Class Worksheet #1

Solids of Revolution

Disks

Calculus Class Worksheet #1 Unit 11 Solutions

Use "disks" to find the volume generated by rotating the given region about the given line. For each problem, you must

a) sketch the generating region, showing a typical generating rectangle,
b) write an expression for the volume generated by this rectangle,
c) express the exact volume of the solid as a definite integral, and
d) evaluate the integral.

Sample 1a. The region in the first quadrant bounded by $x + 2y = 10$ and the coordinate axes is rotated about the x-axis.

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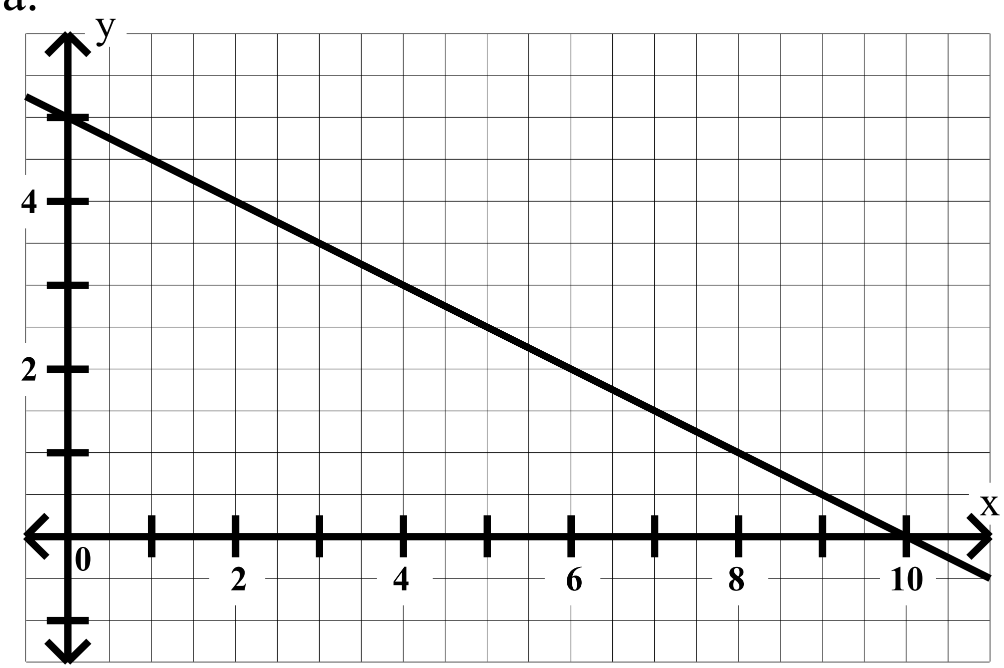
a.



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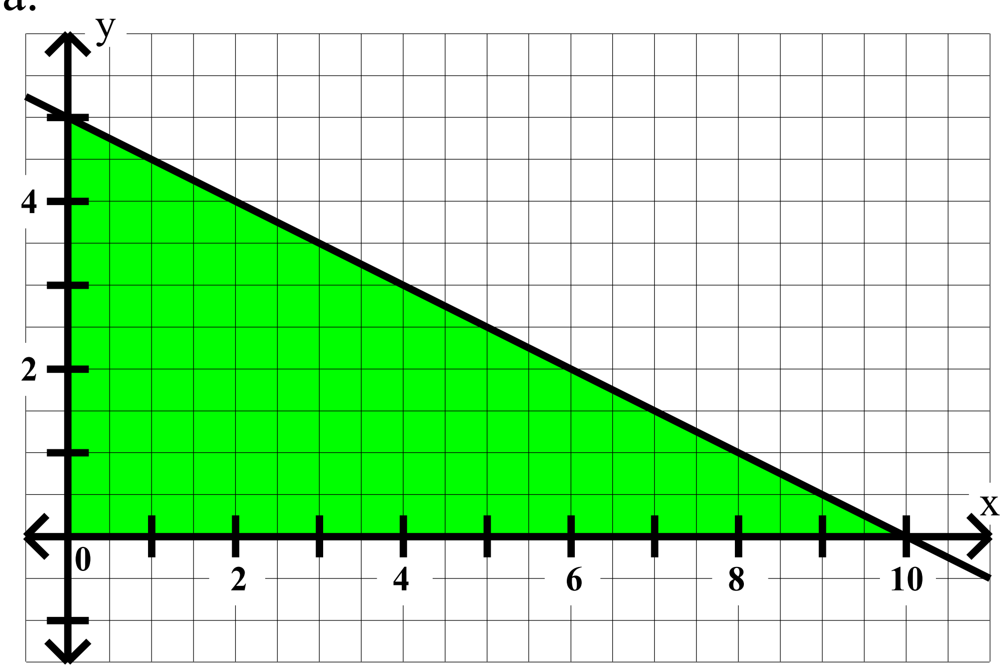

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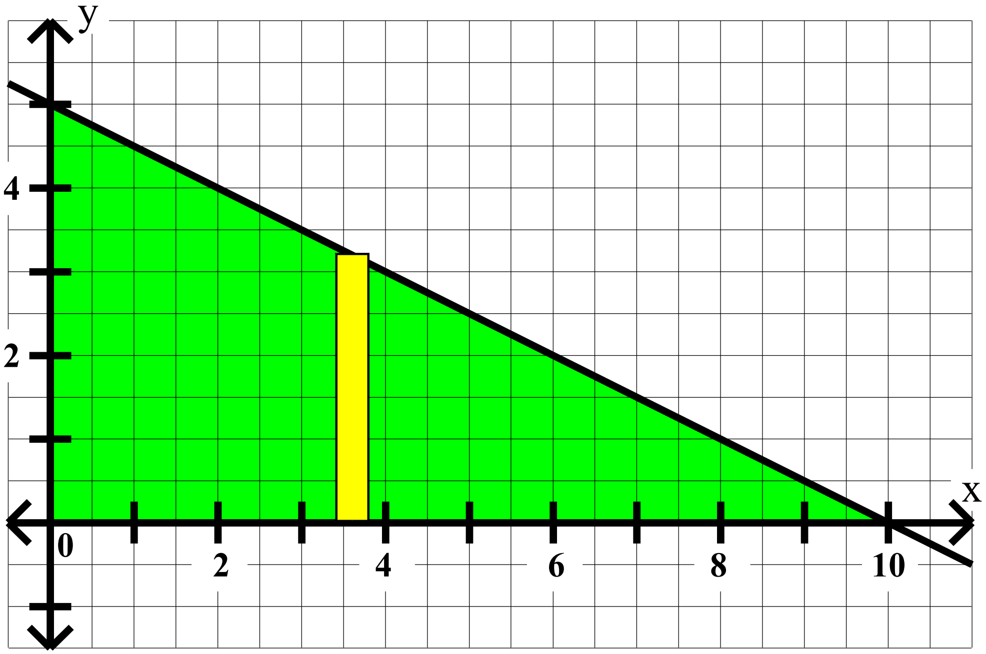

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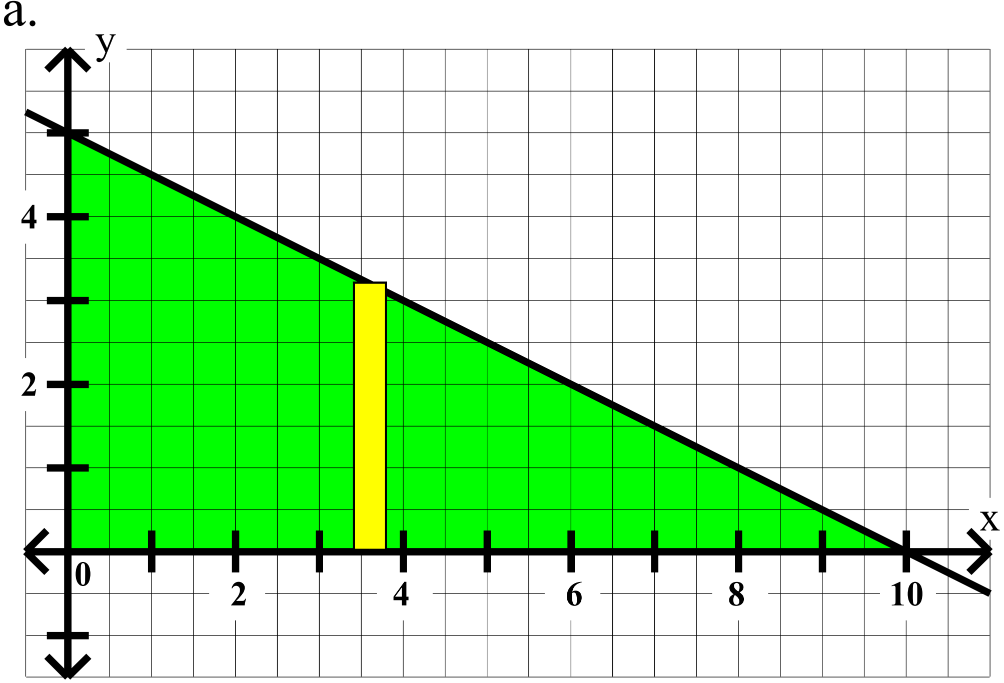
Disks: $V = \pi r^2 h$

a.



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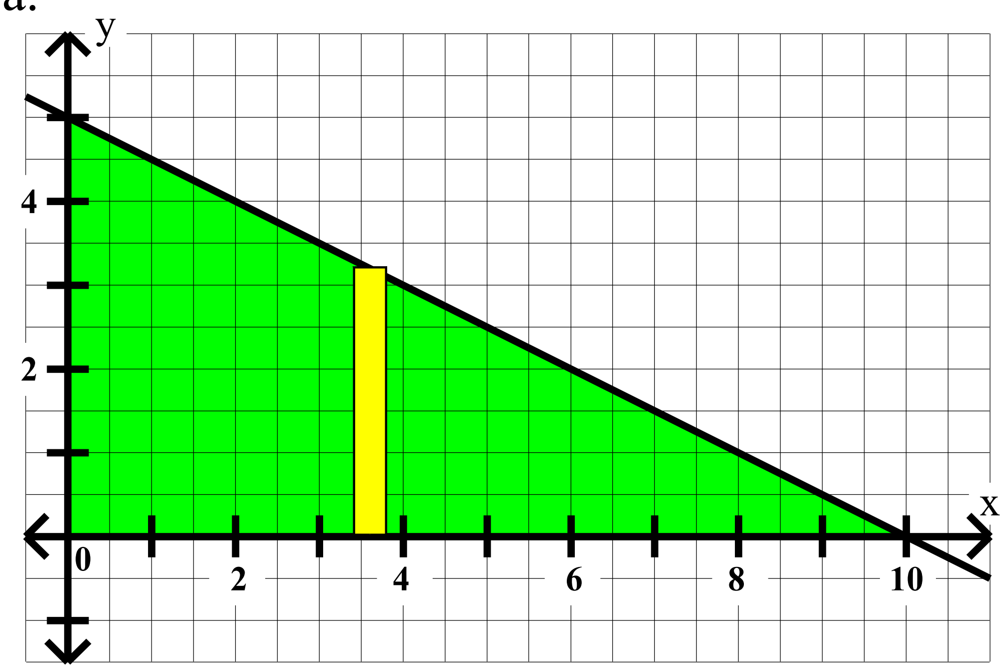

Disks: $V = \pi r^2 h$

$r =$

$h =$

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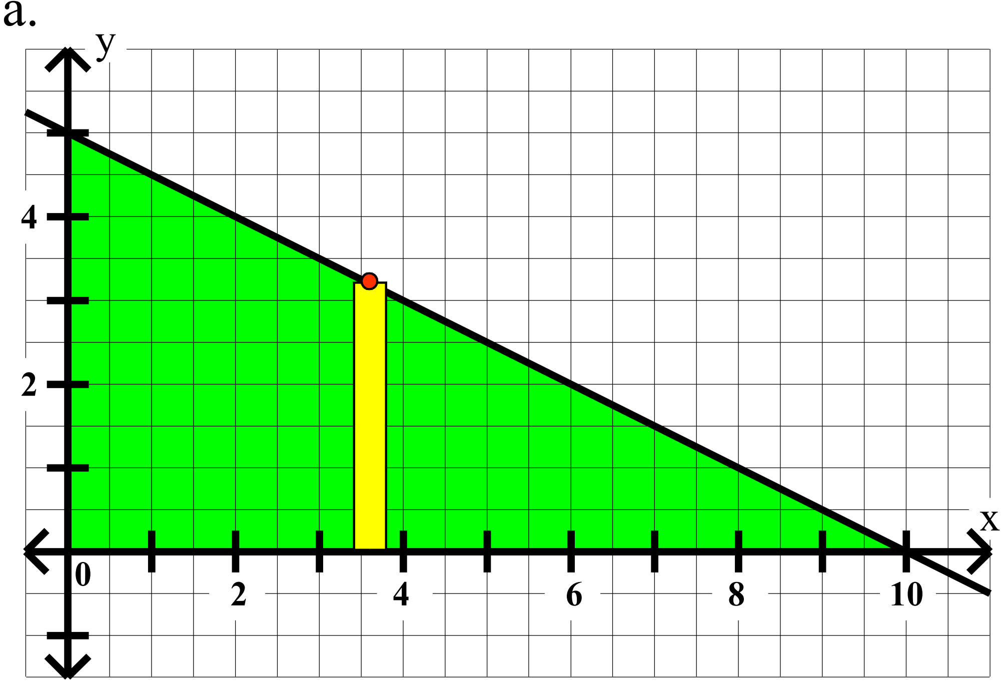

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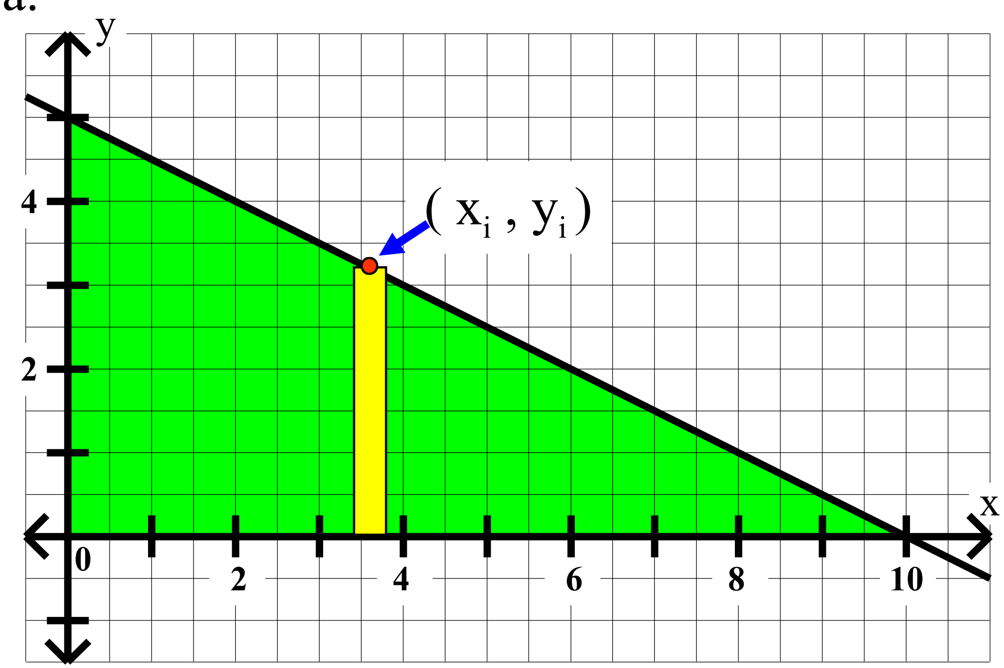

Disks: $V = \pi r^2 h$

r =

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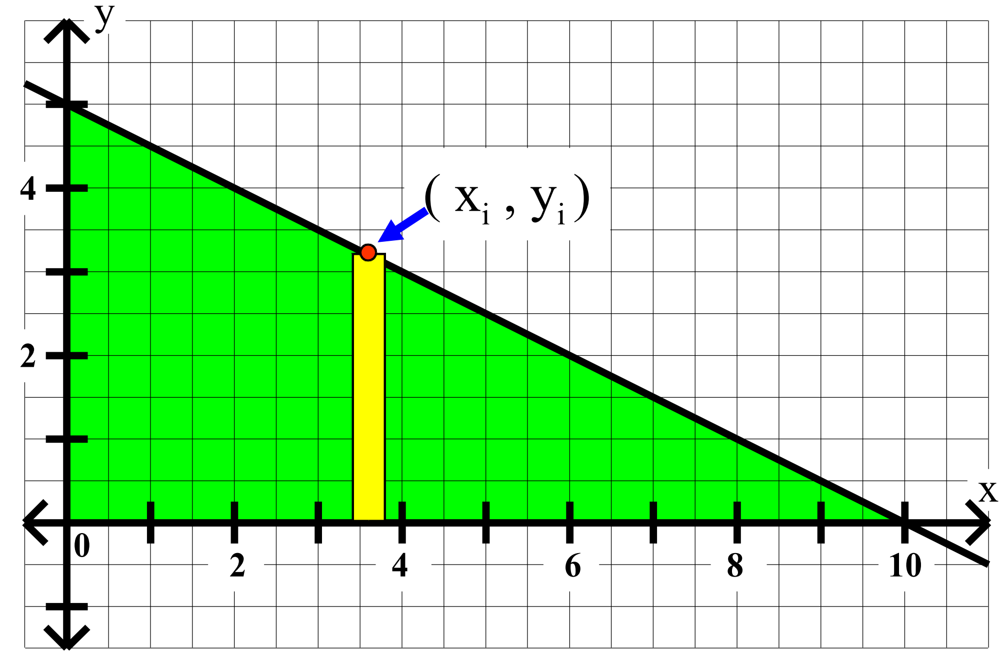

Disks: $V = \pi r^2 h$

$r = y_i$

$h =$

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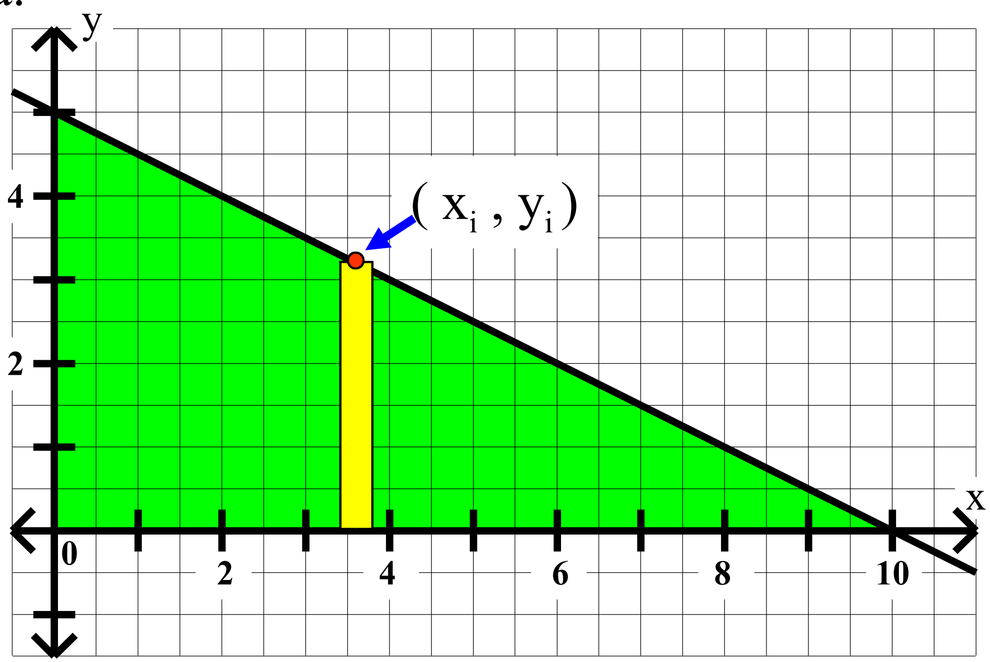

Disks: $V = \pi r^2 h$

$r = y_i$

$h = \Delta x$

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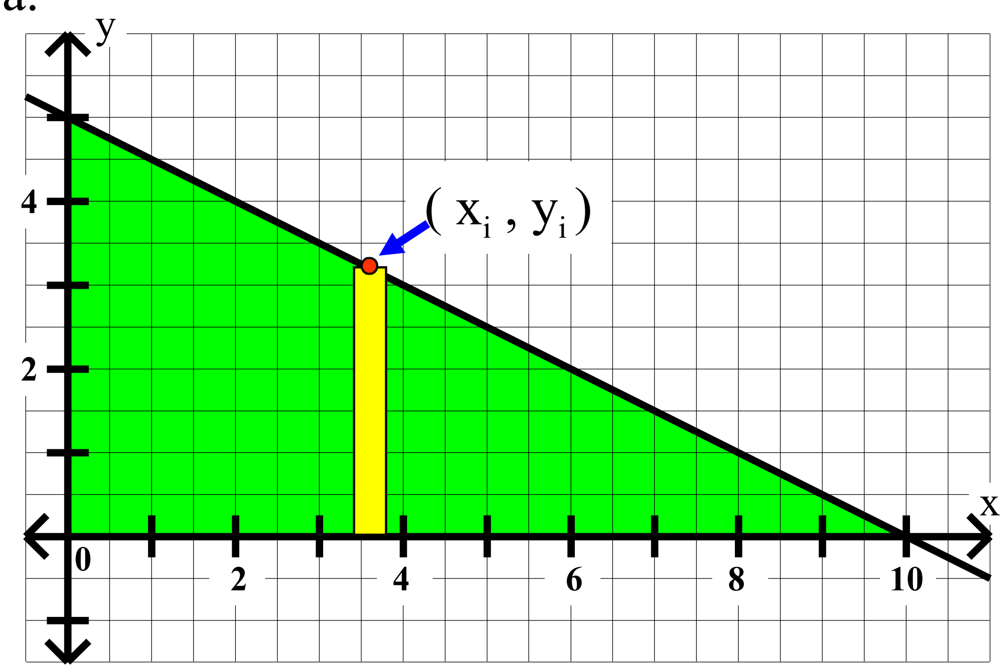

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

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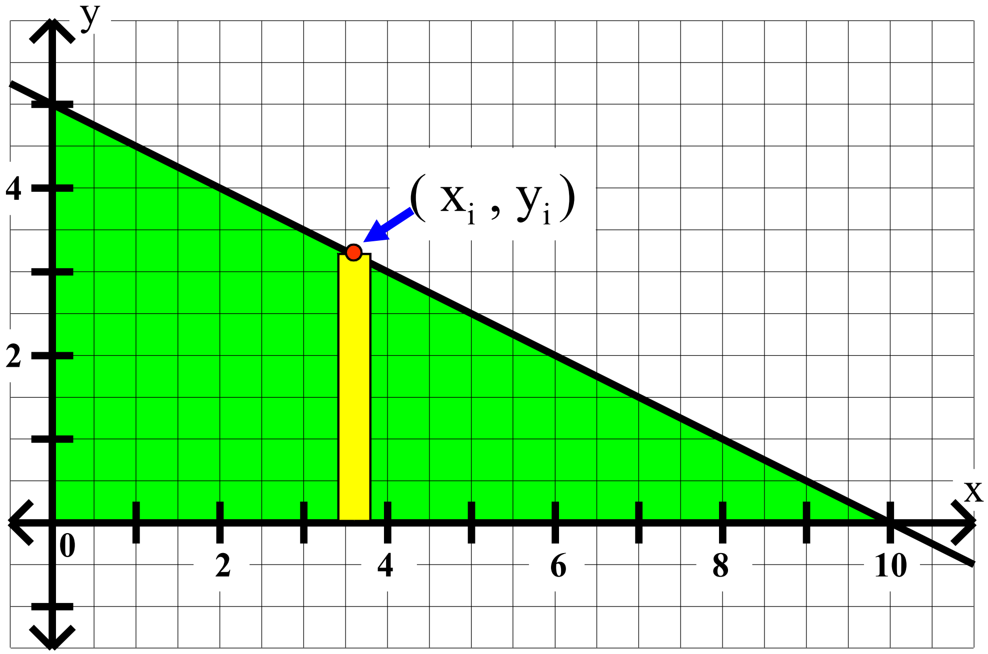

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i =$

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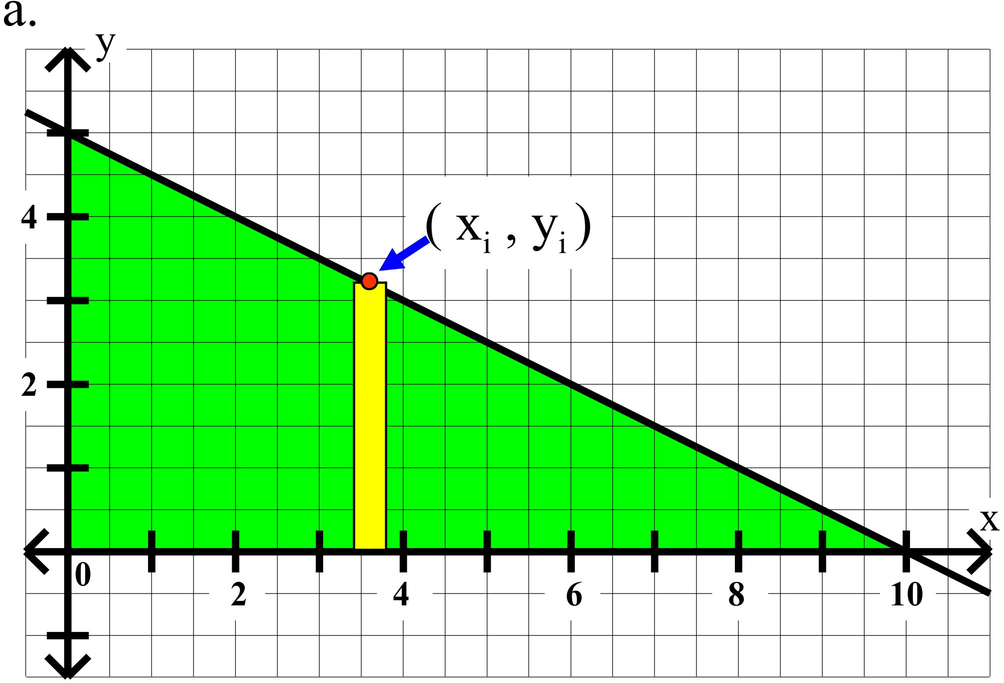

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi($

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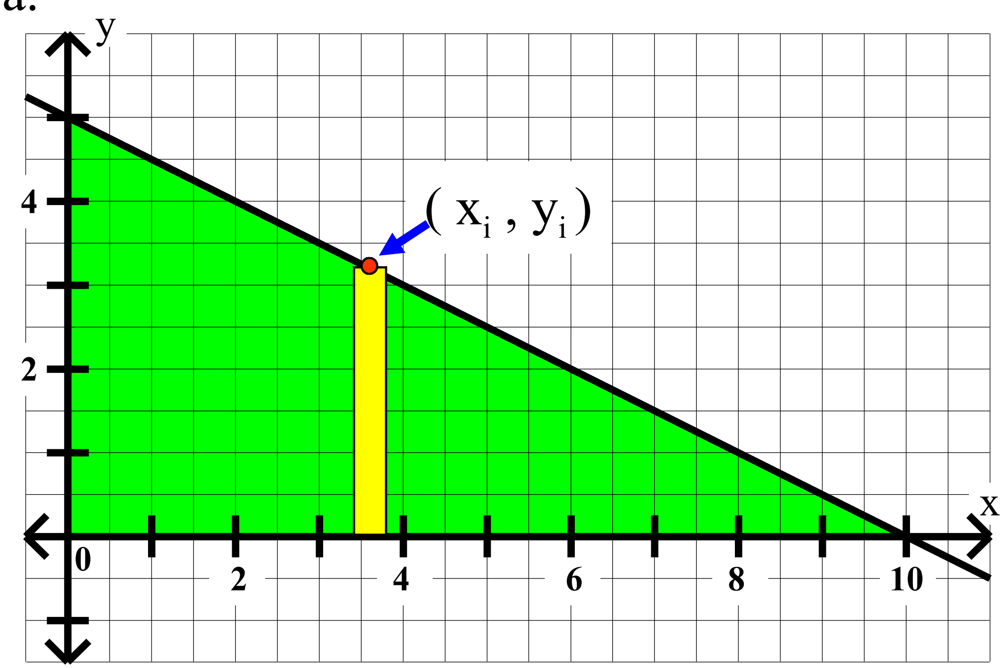

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)$

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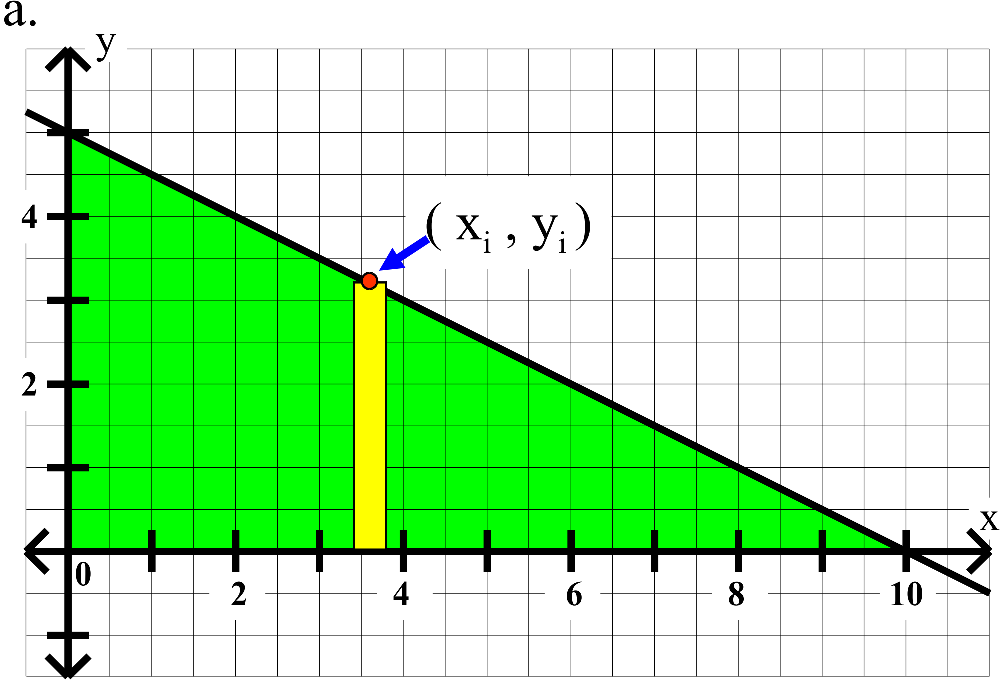

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2$

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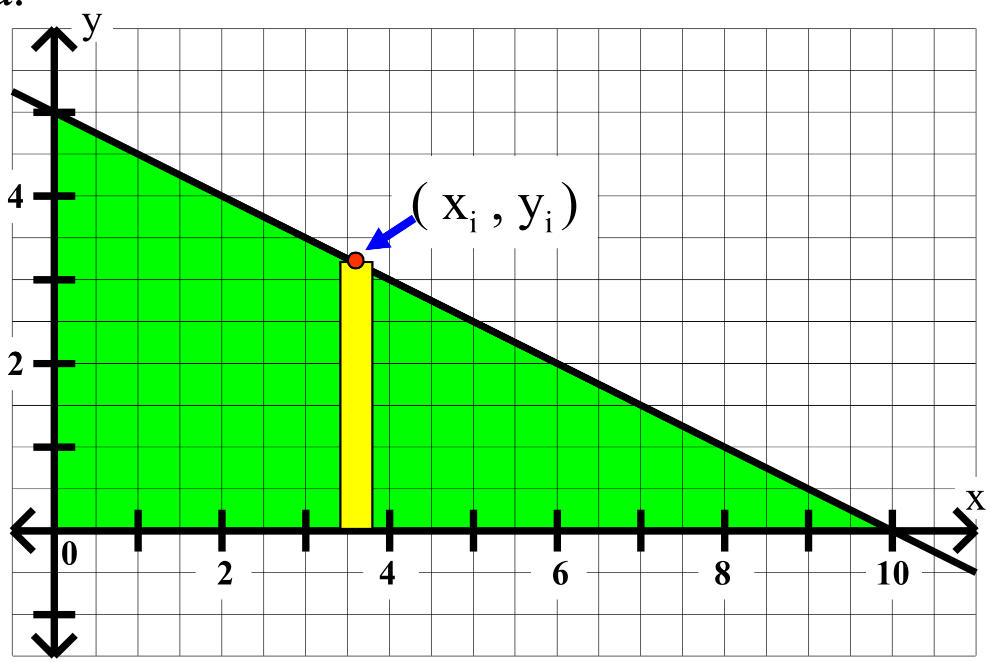

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \Delta x$

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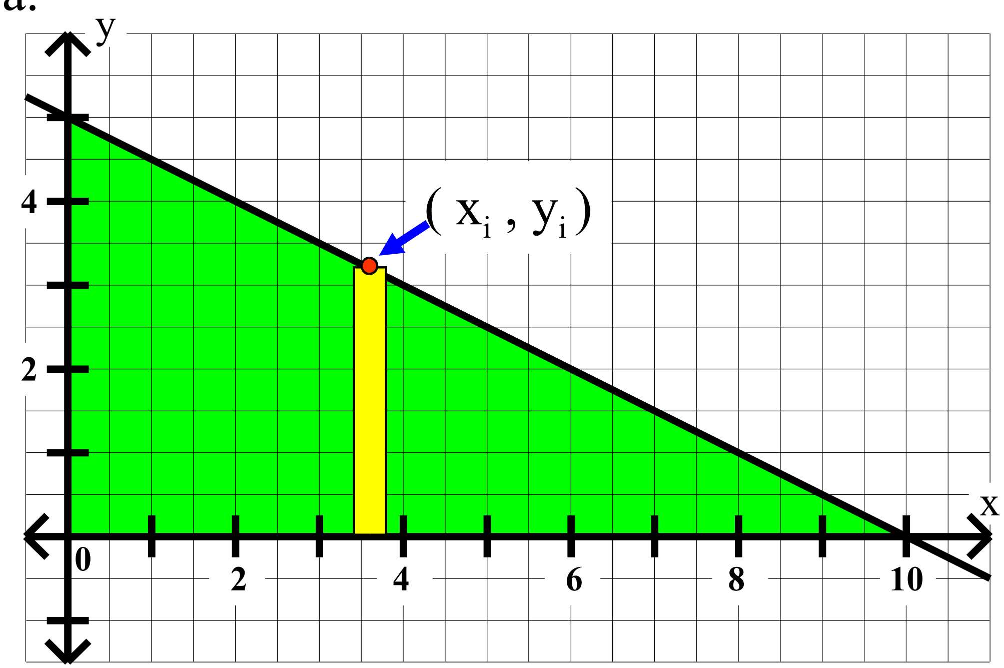

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b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2\,\Delta x$

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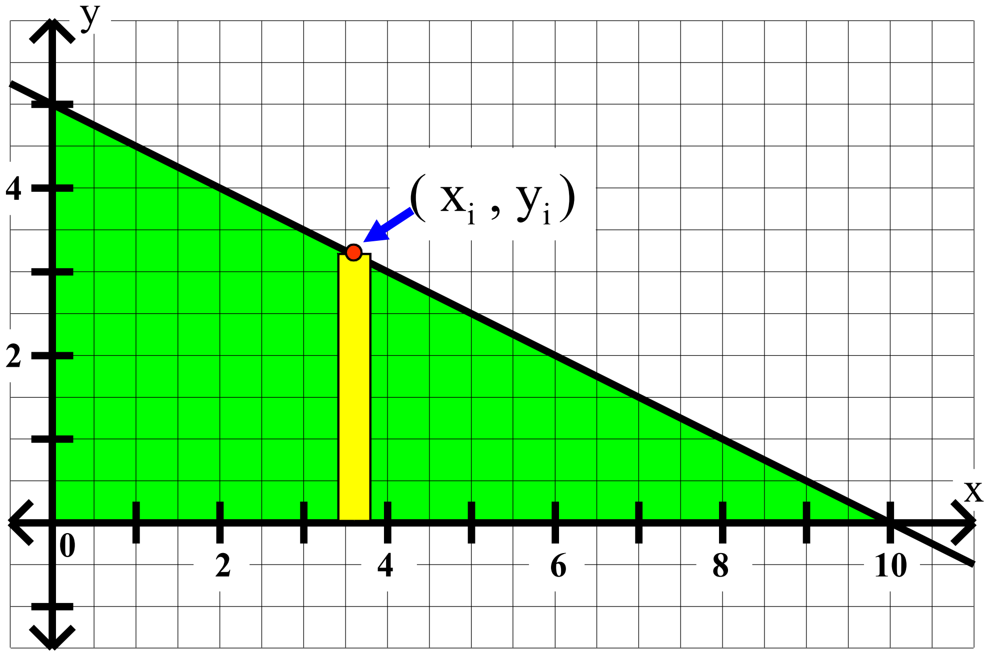

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \Delta x$

c. V =

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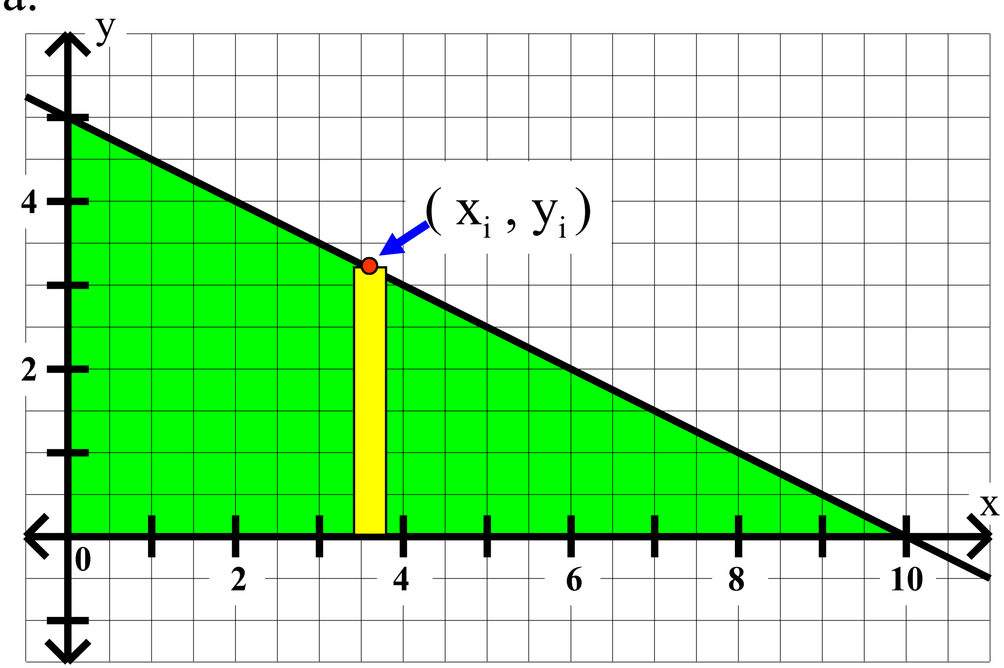

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2\ \Delta x$

c. $V = \pi$

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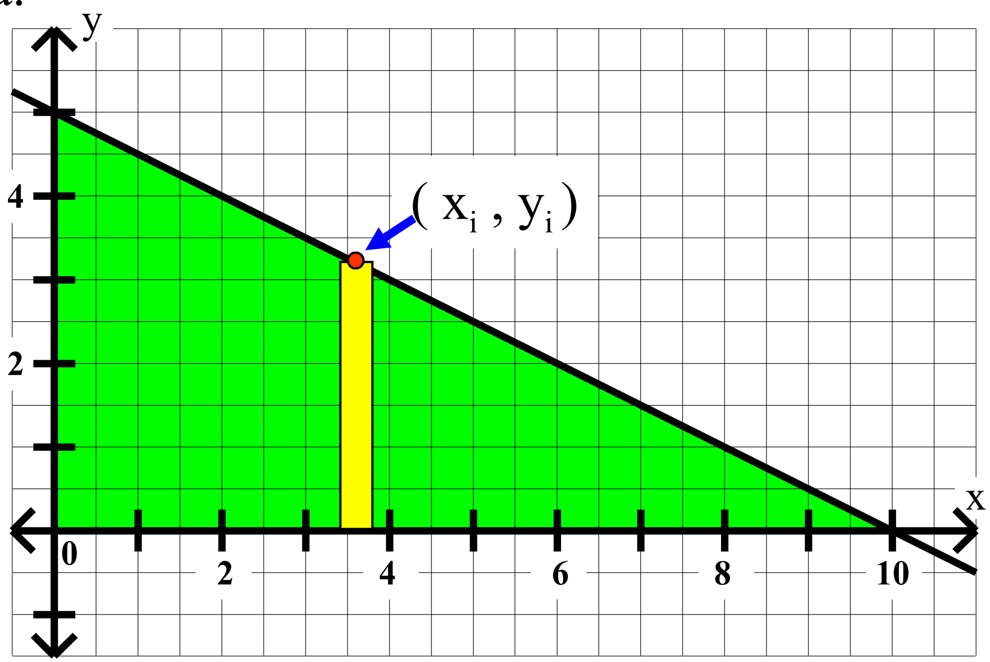

Disks: $V = \pi r^2 h$

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b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \Delta x$

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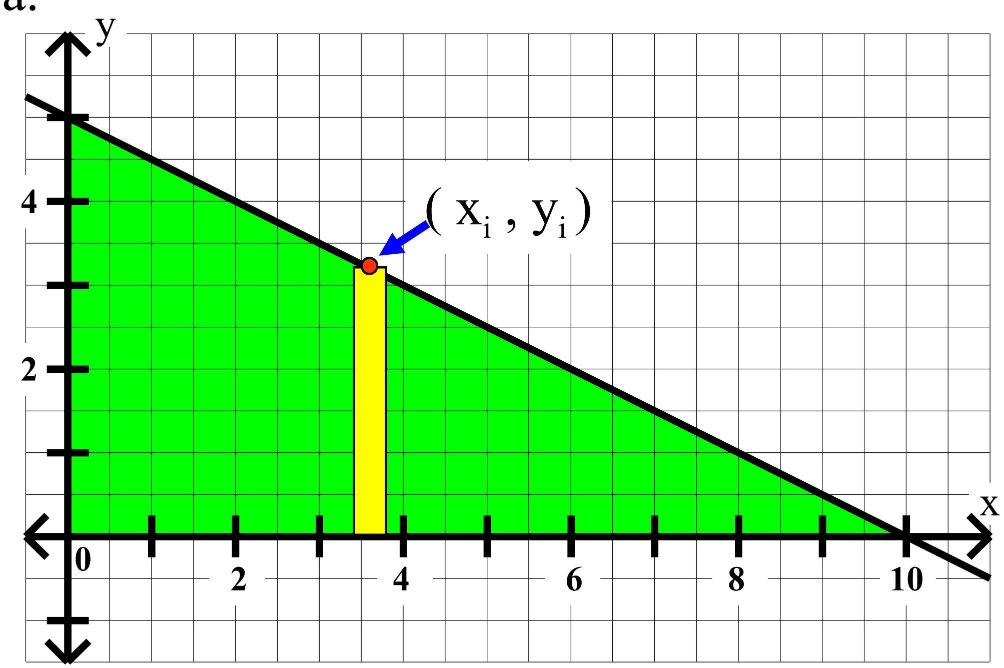

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \Delta x$

c. $V = \pi\int(\frac{-1}{2}x + 5)^2\, dx$

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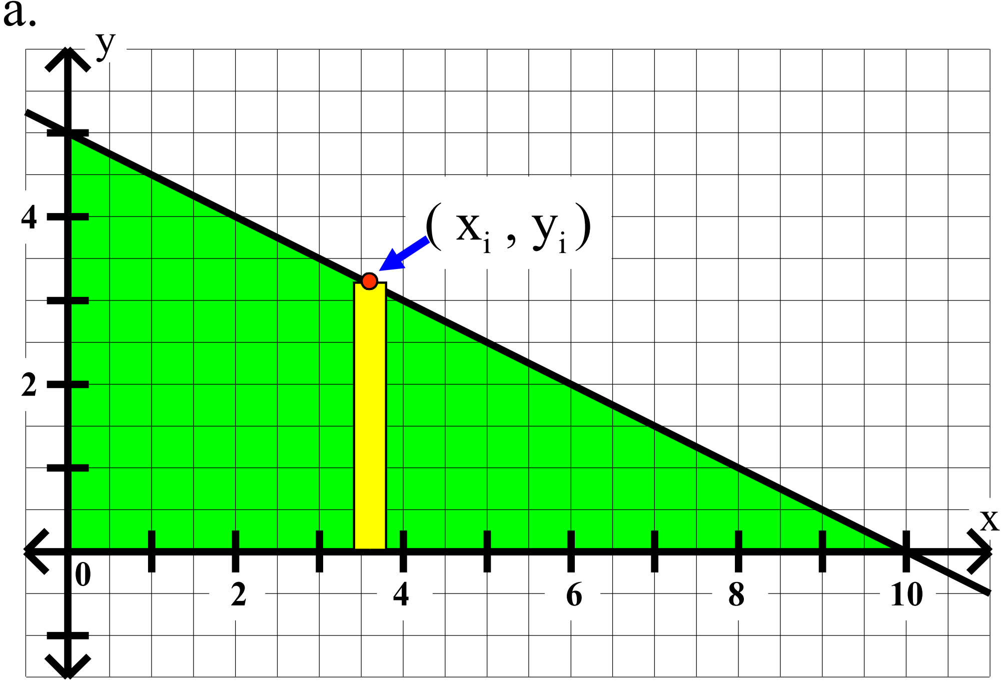

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \Delta x$

c. $V = \pi\int_0 (\frac{-1}{2}x + 5)^2\, dx$

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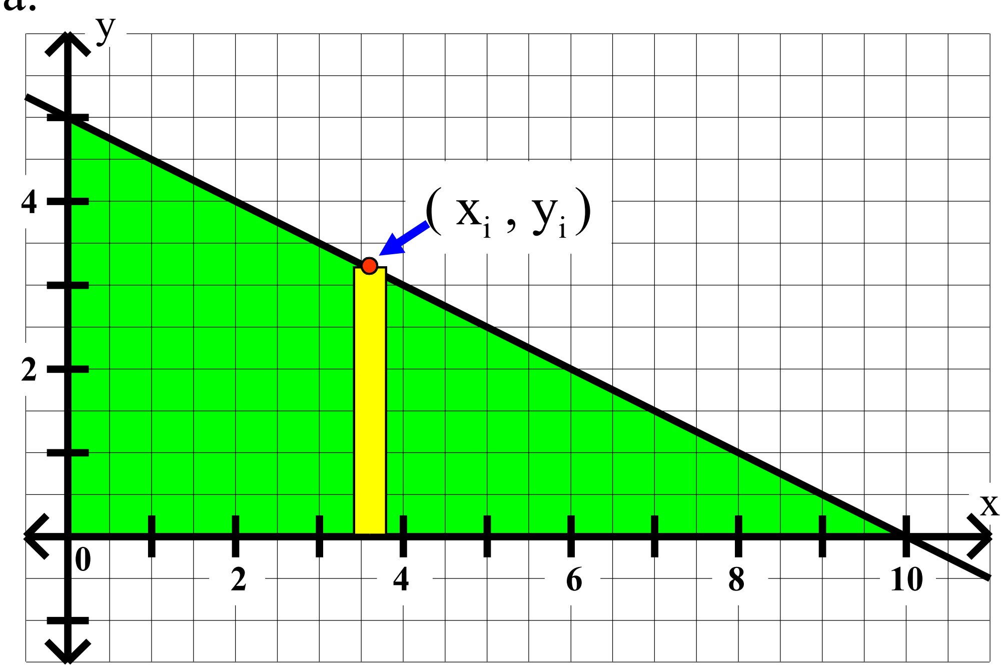

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \, \Delta x$

c. $V = \pi\int_0^{10} (\frac{-1}{2}x + 5)^2 \, dx$

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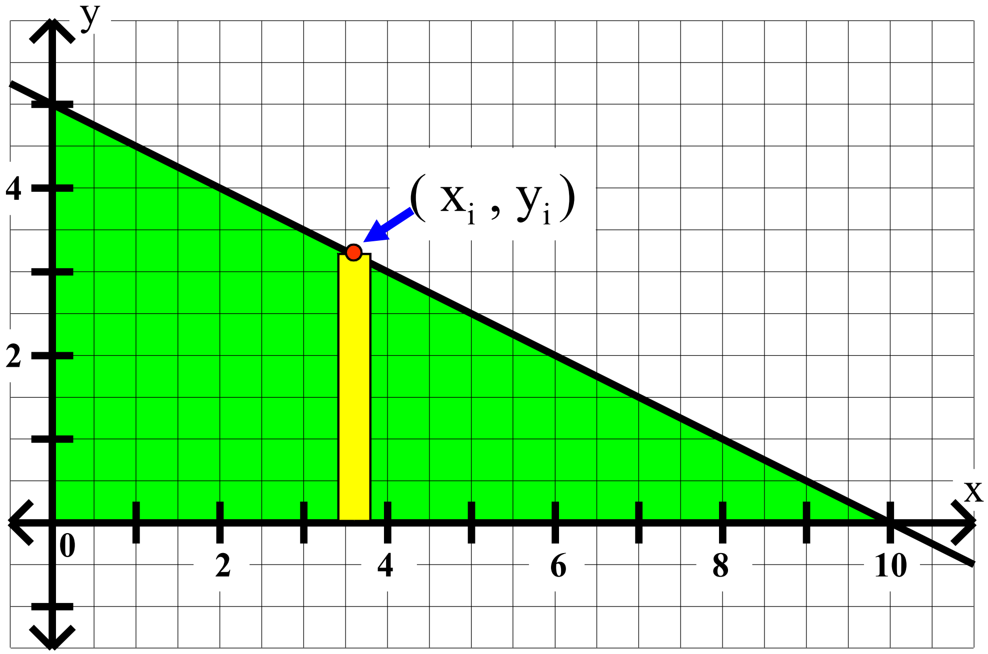

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \, \Delta x$

c. $V = \pi\int_0^{10} (\frac{-1}{2}x + 5)^2 \, dx$

d. $V \approx$

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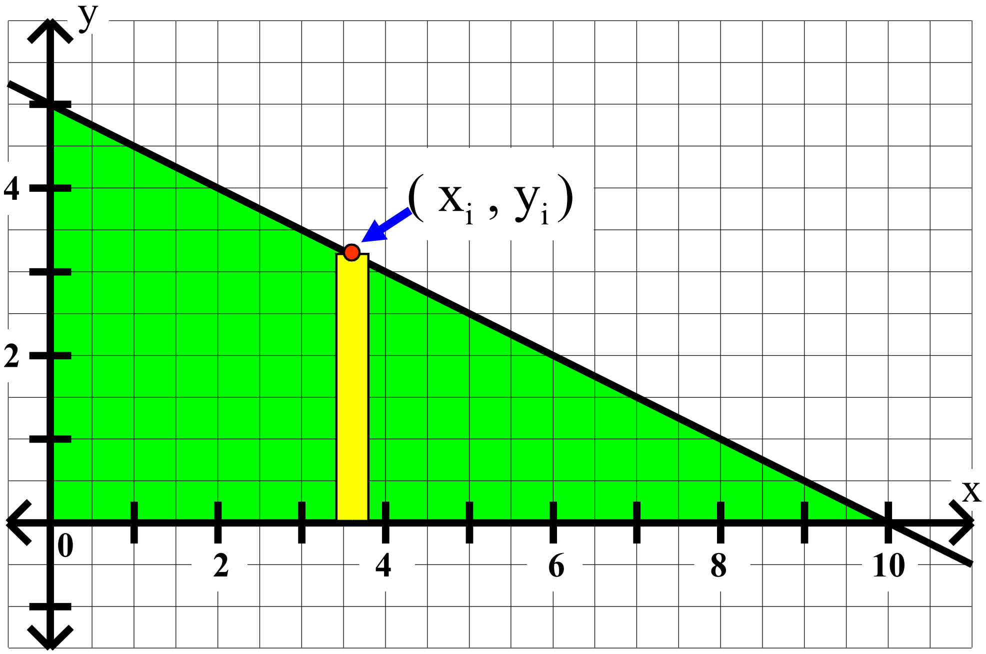

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2\ \Delta x$

c. $V = \pi\int_0^{10}(\frac{-1}{2}x + 5)^2\ dx$

d. $V \approx 262$ cu. units

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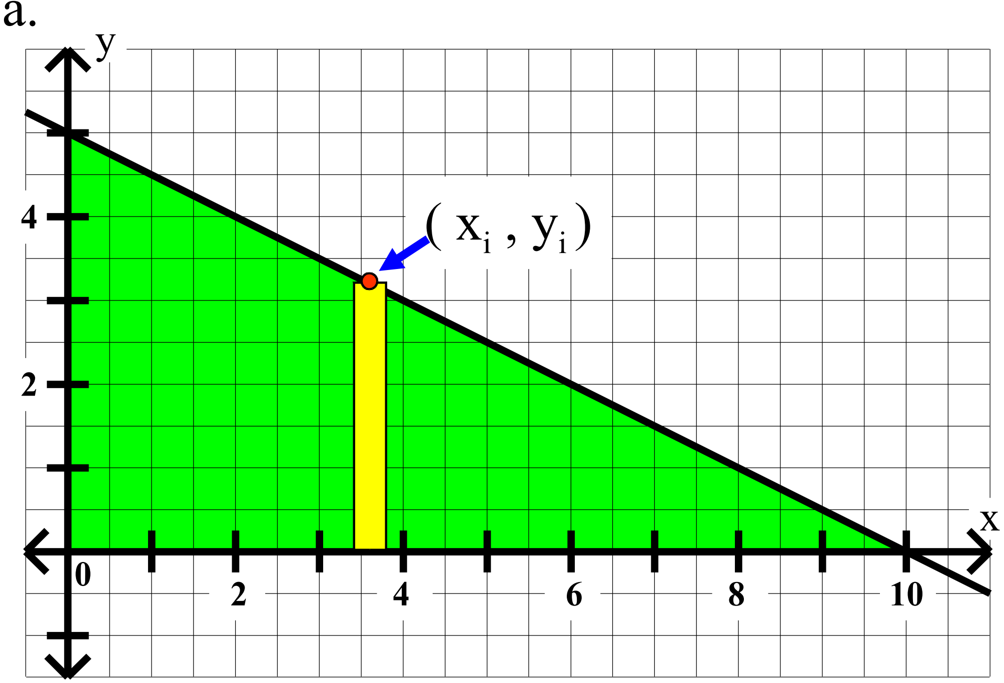

Disks: $V = \pi r^2 h$

$r = y_i = \frac{-1}{2}x_i + 5$

$h = \Delta x$

b. $V_i = \pi(\frac{-1}{2}x_i + 5)^2 \,\Delta x$

c. $V = \pi\int_0^{10} (\frac{-1}{2}x + 5)^2 \,dx$

d. $V \approx 262$ cu. units

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Sample 1b. The region in the first quadrant bounded by $x + 2y = 10$ and the coordinate axes is rotated about the y-axis.

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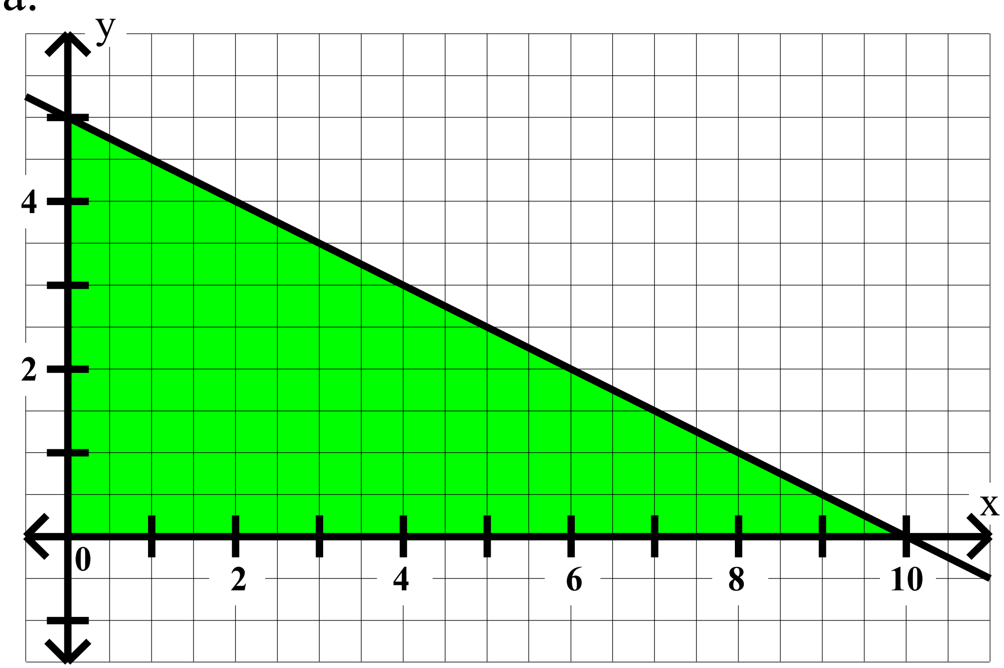
Sample 1b. The region in the first quadrant bounded by x + 2y = 10 and the coordinate axes is rotated about the y-axis.

a.



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Sample 1b. The region in the first quadrant bounded by x + 2y = 10 and the coordinate axes is rotated about the y-axis.

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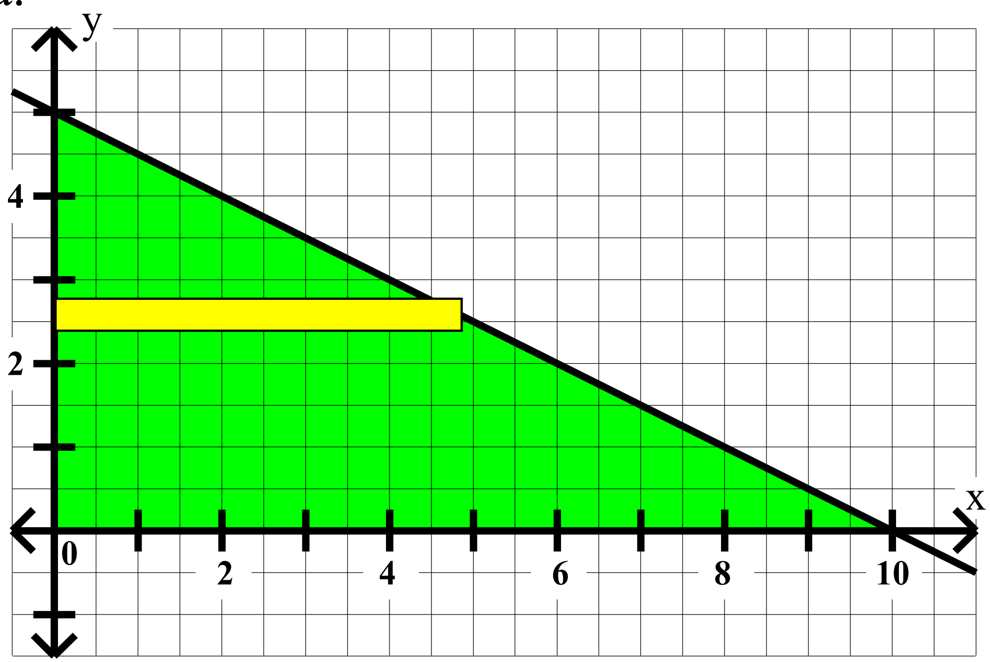


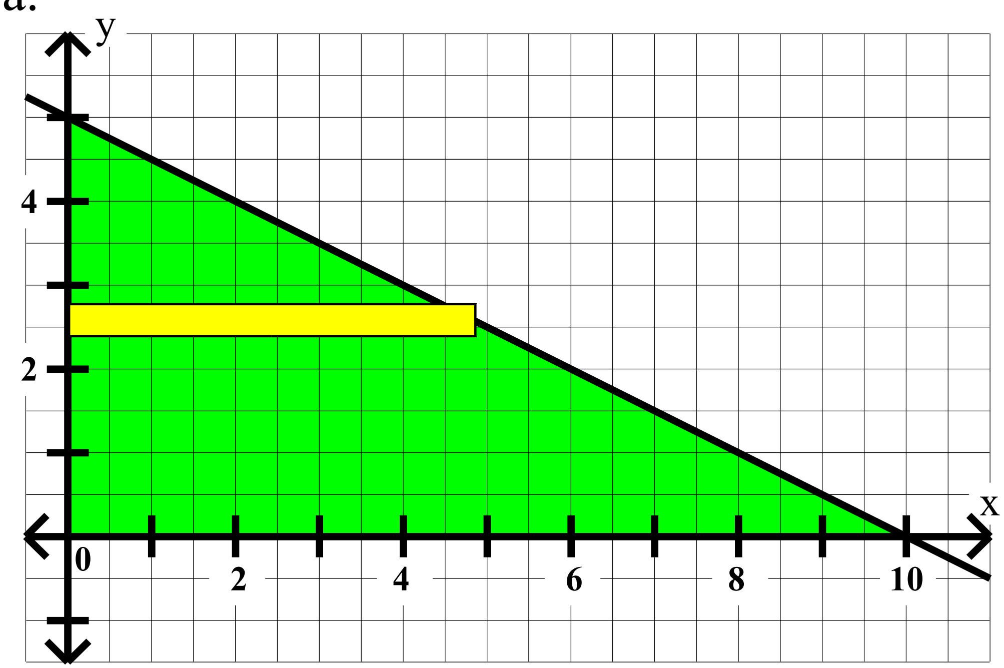
Calculus Class Worksheet #1 Unit 11 Solutions

Use "disks" to find the volume generated by rotating the given region about the given line. For each problem, you must

a) sketch the generating region, showing a typical generating rectangle,
b) write an expression for the volume generated by this rectangle,
c) express the exact volume of the solid as a definite integral, and
d) evaluate the integral.

Sample 1b. The region in the first quadrant bounded by x + 2y = 10 and the coordinate axes is rotated about the y-axis.

a.



Disks: $V = \pi r^2 h$

r =

h =

Calculus Class Worksheet #1 Unit 11 Solutions

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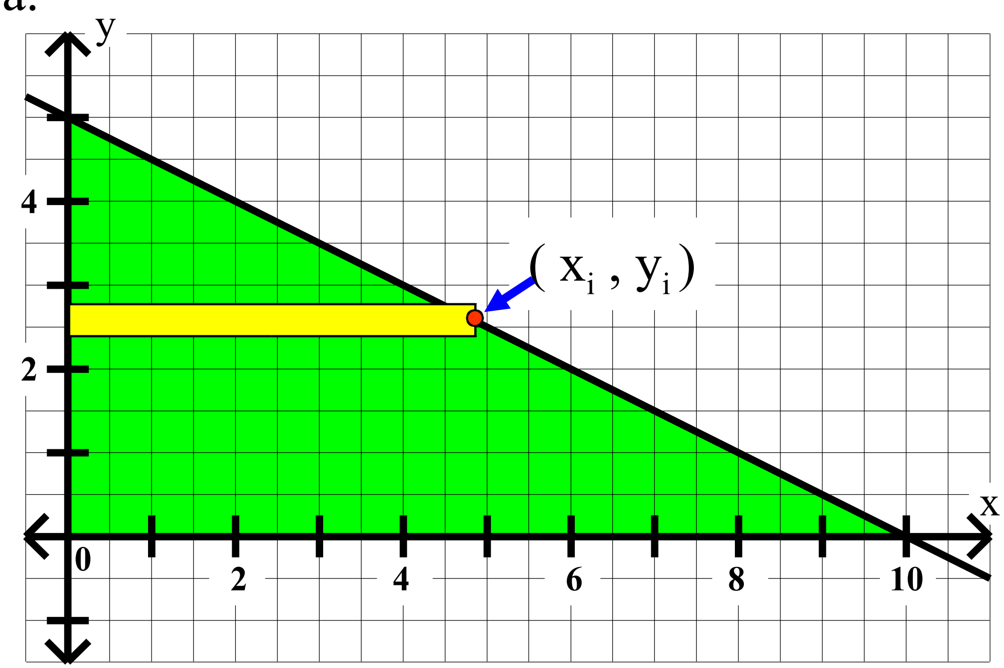

Disks: $V = \pi r^2 h$

r =

h =

Calculus Class Worksheet #1   Unit 11   Solutions

Use "disks" to find the volume generated by rotating the given region about the given line. For each problem, you must

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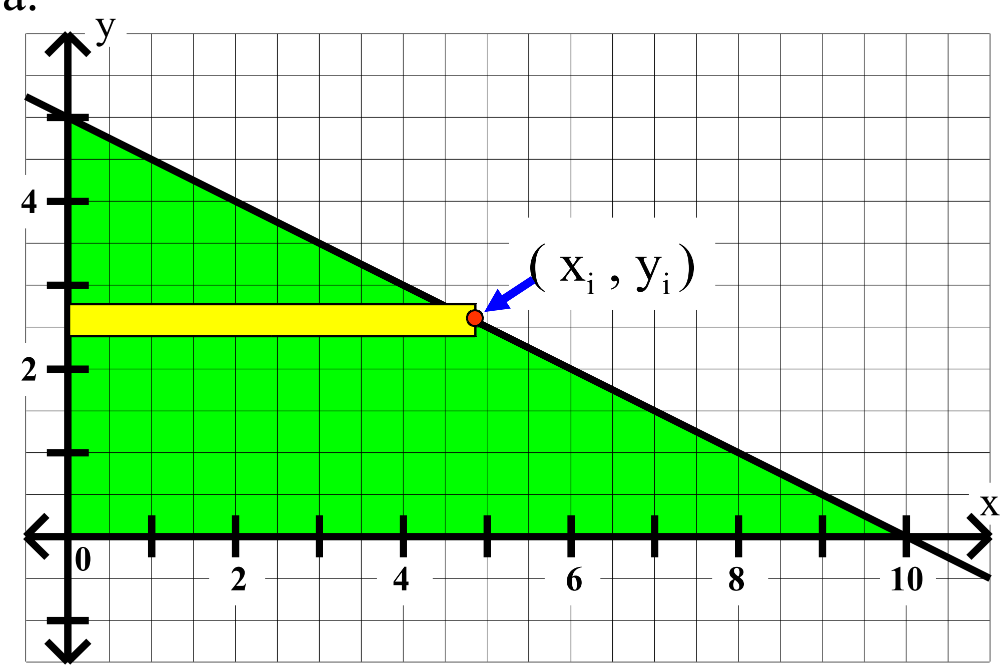

Disks: $V = \pi r^2 h$

$r = x_i$

$h =$

Calculus Class Worksheet #1 Unit 11 Solutions

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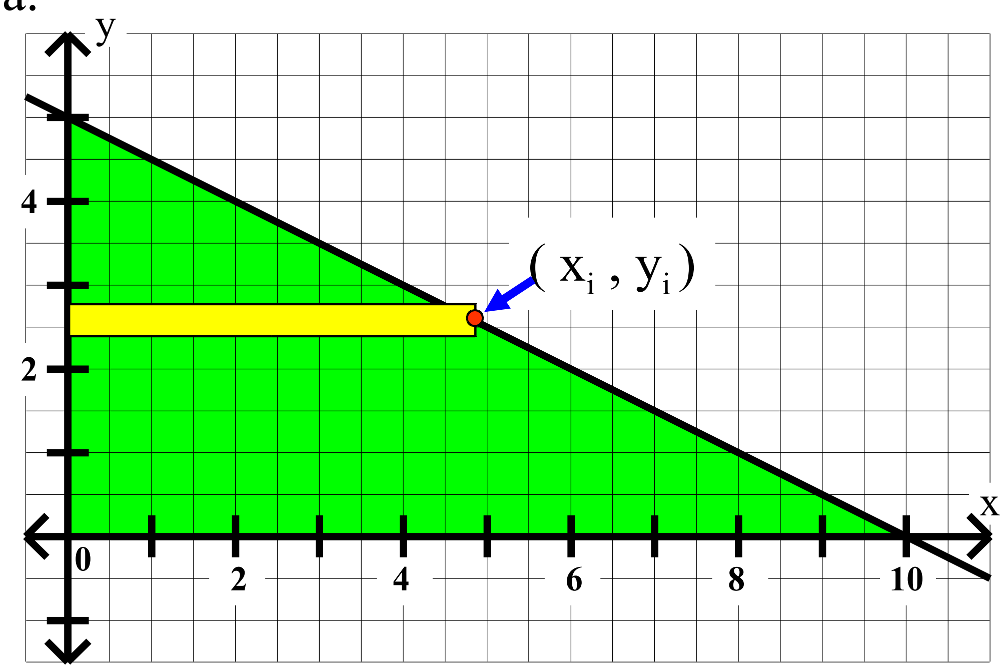

Disks: $V = \pi r^2 h$

$r = x_i$

$h = \Delta y$

Calculus Class Worksheet #1 Unit 11 Solutions

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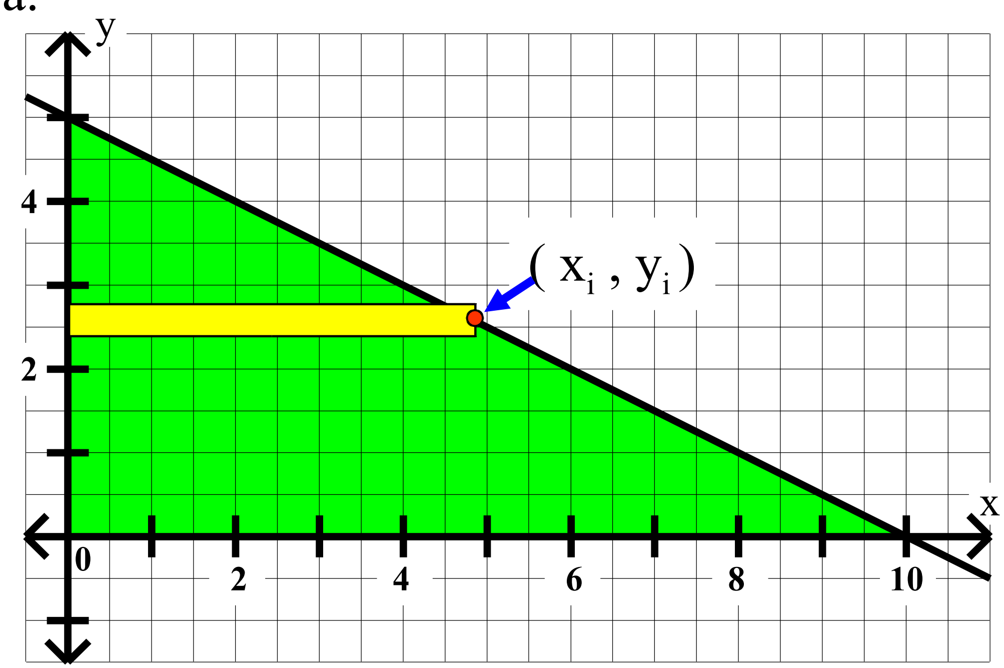

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

Calculus Class Worksheet #1   Unit 11   Solutions

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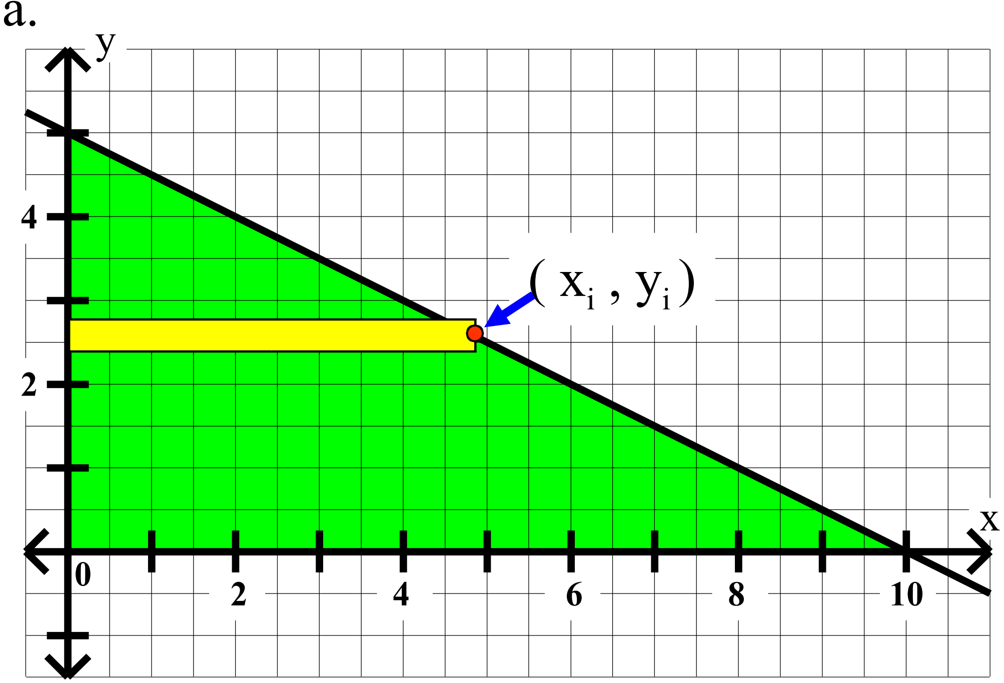

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i =$

Calculus Class Worksheet #1   Unit 11   Solutions

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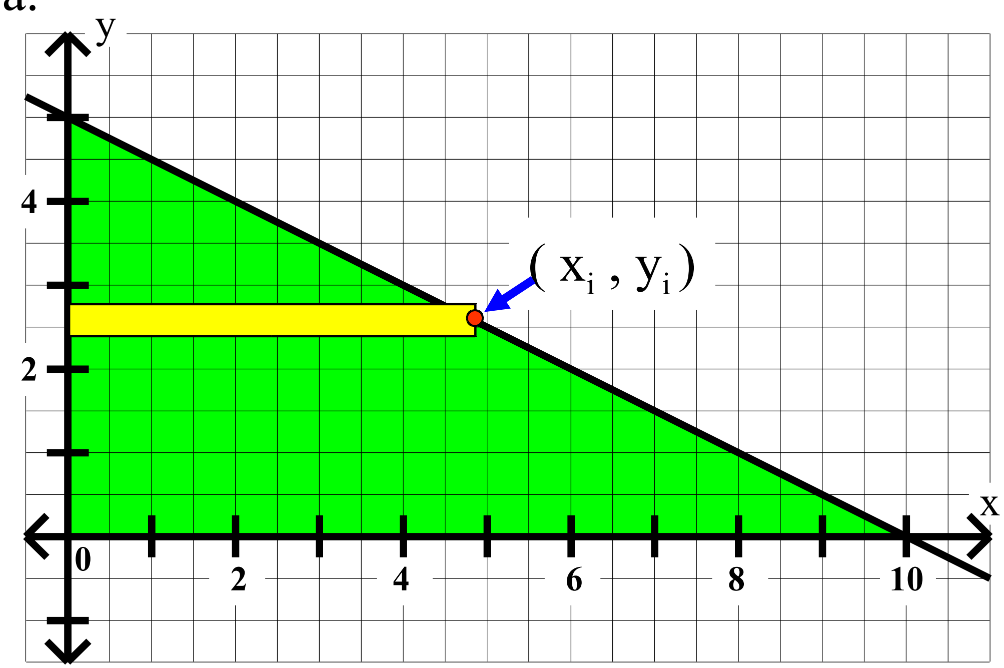

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi$

Calculus Class Worksheet #1 Unit 11 Solutions

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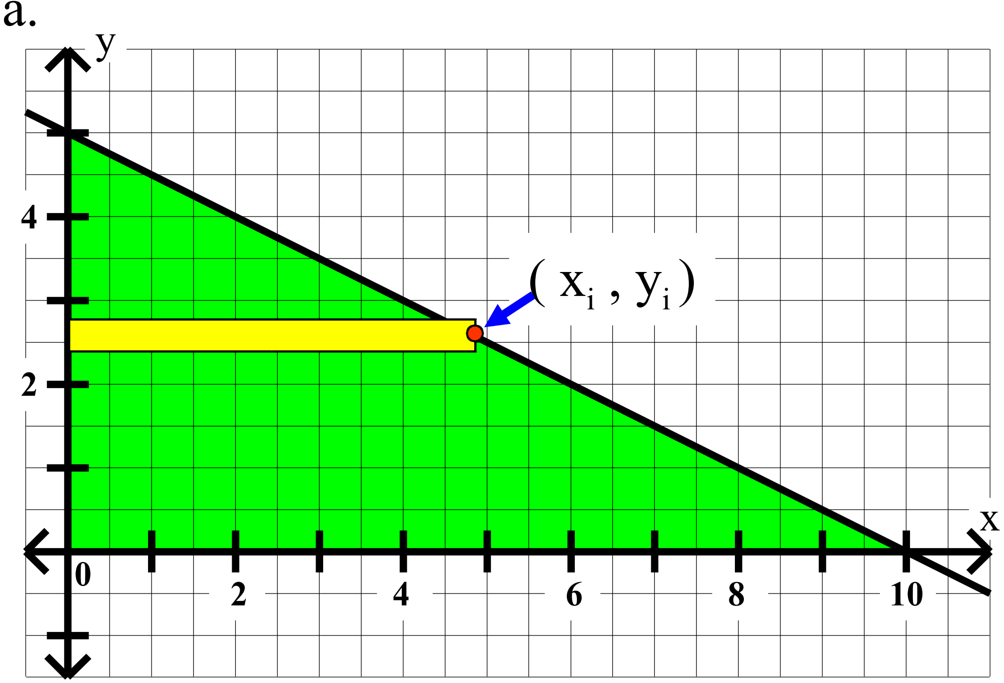

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)$

Calculus Class Worksheet #1 Unit 11 Solutions

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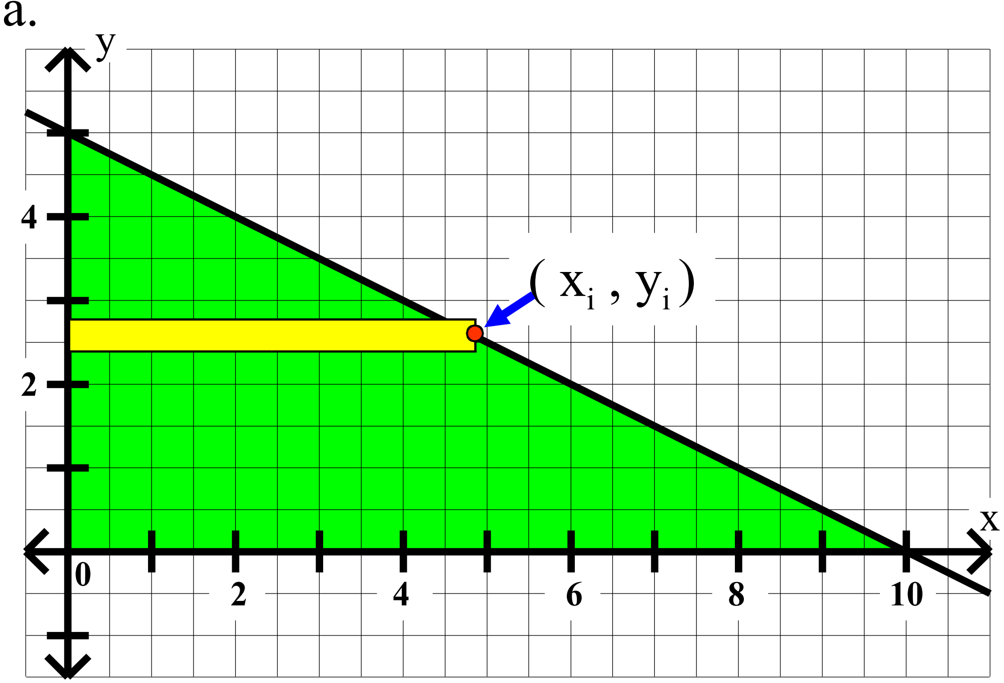

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2$

Calculus Class Worksheet #1 Unit 11 Solutions

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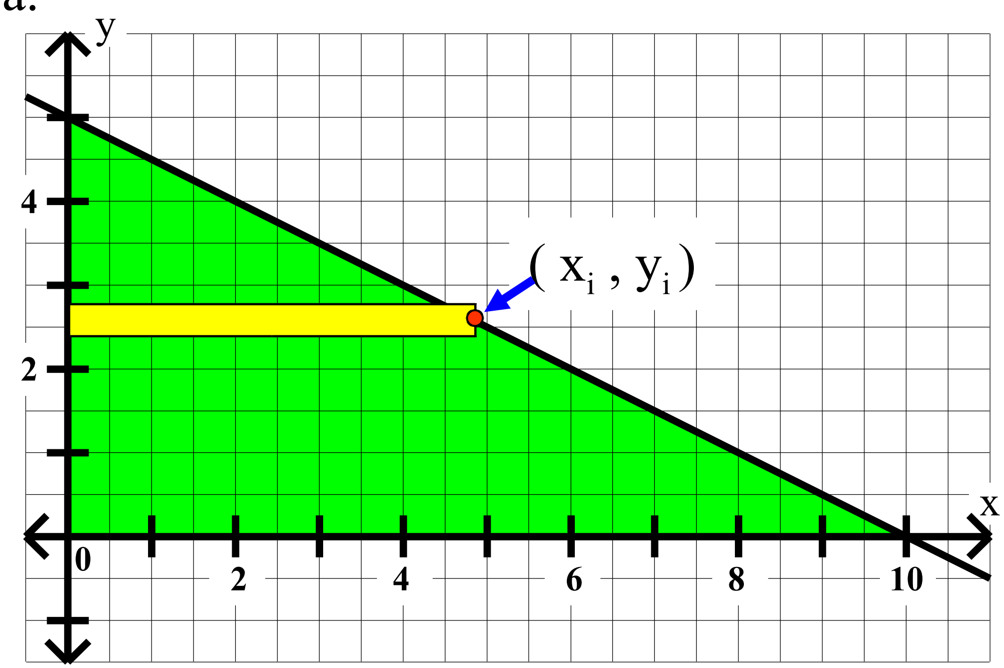

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

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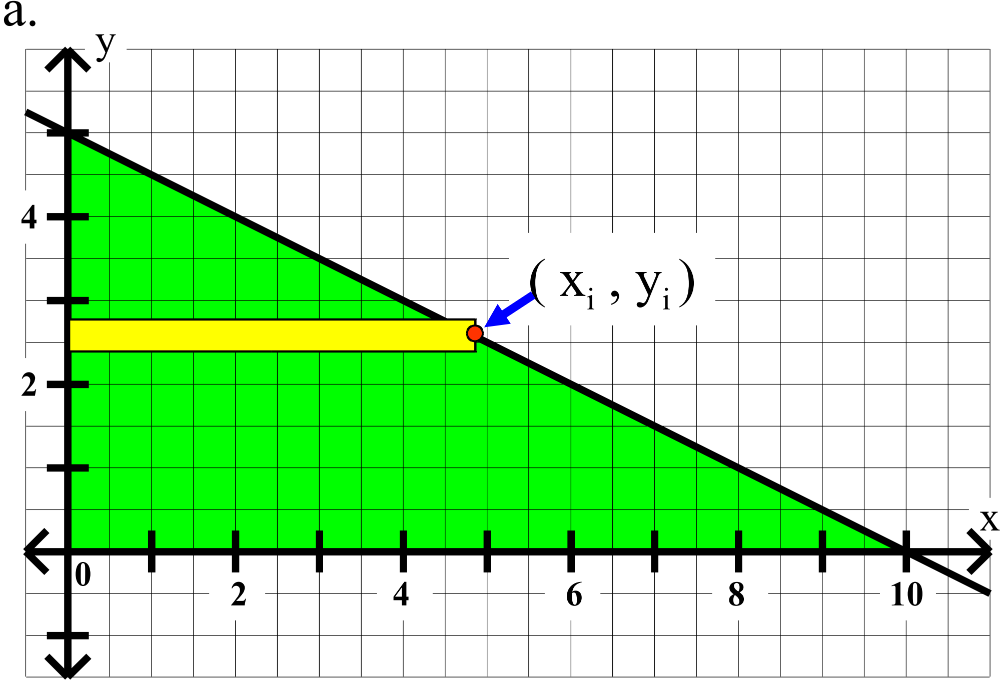

Disks: $V = \pi r^2 h$

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$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

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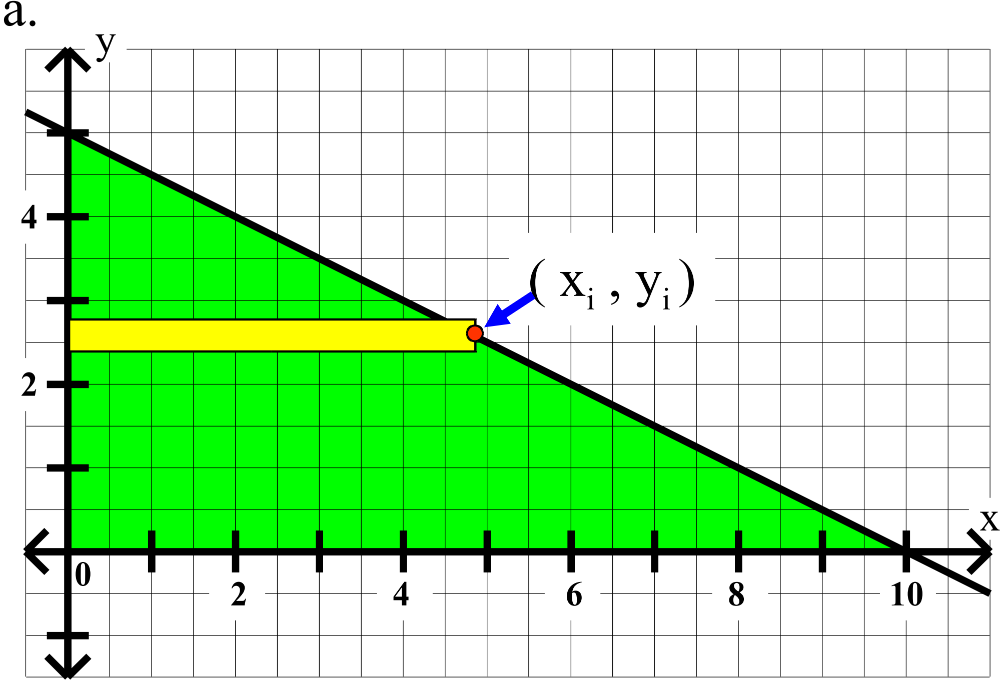

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

c. $V =$

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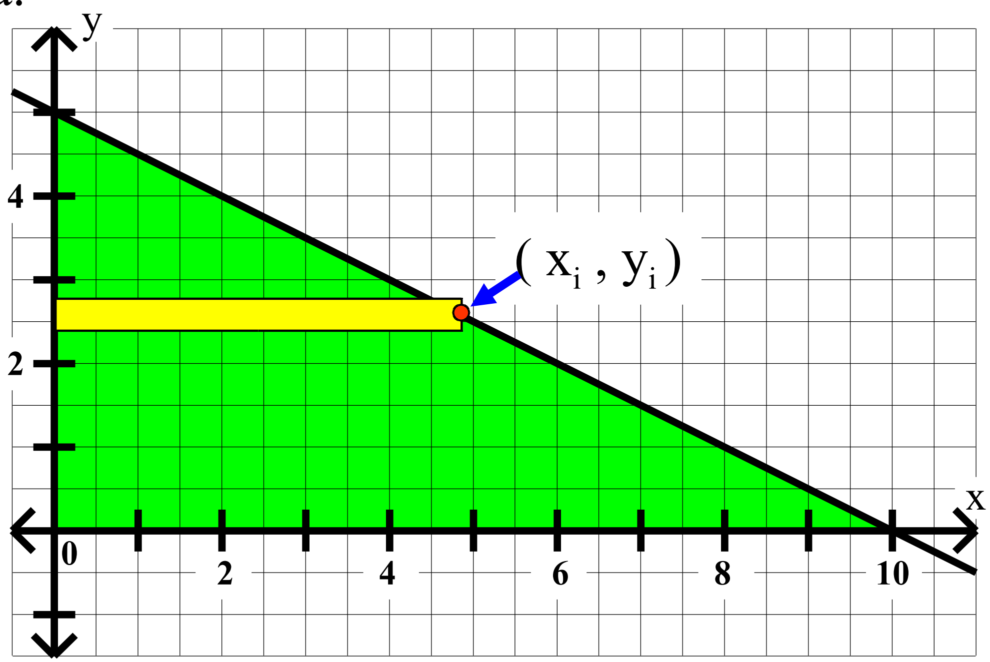

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

c. $V = \pi$

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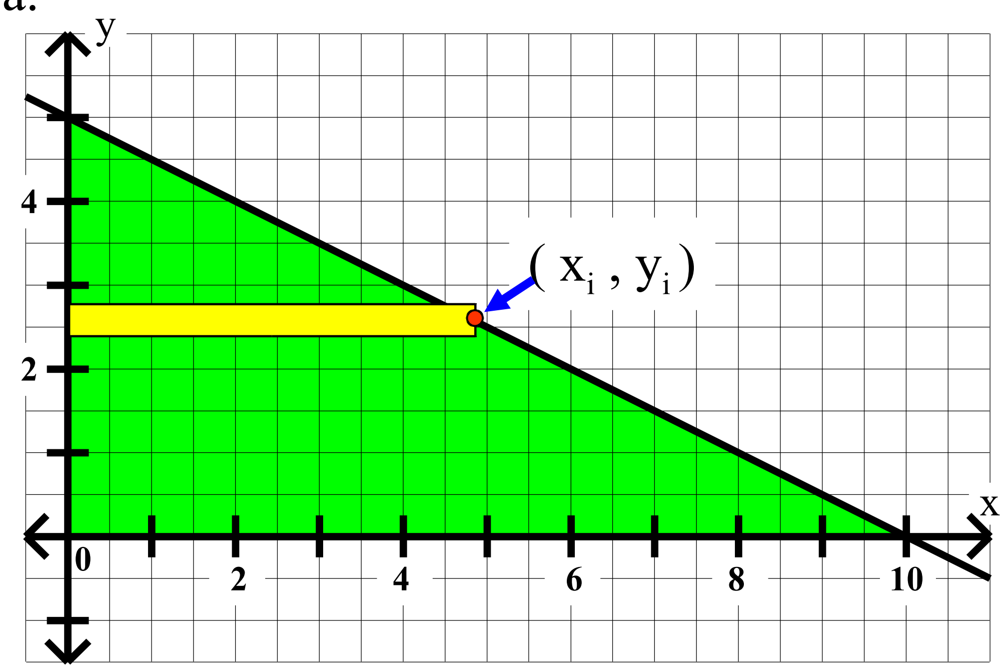

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2\, \Delta y$

c. $V = \pi \int$

Calculus Class Worksheet #1 Unit 11 Solutions

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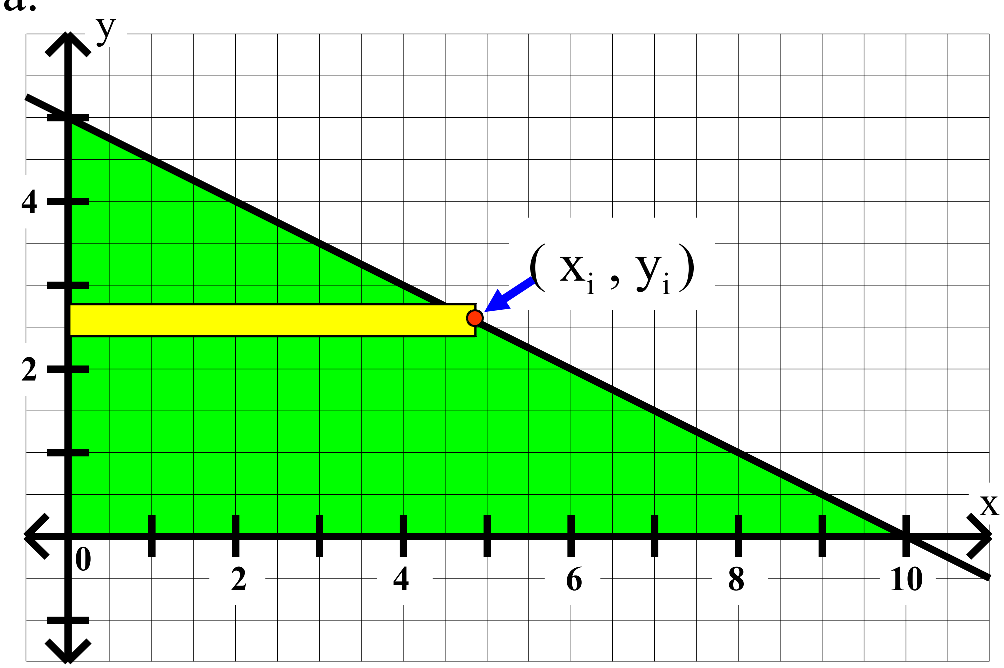

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \, \Delta y$

c. $V = \pi \int (-2y + 10)^2 \, dy$

Calculus Class Worksheet #1   Unit 11   Solutions

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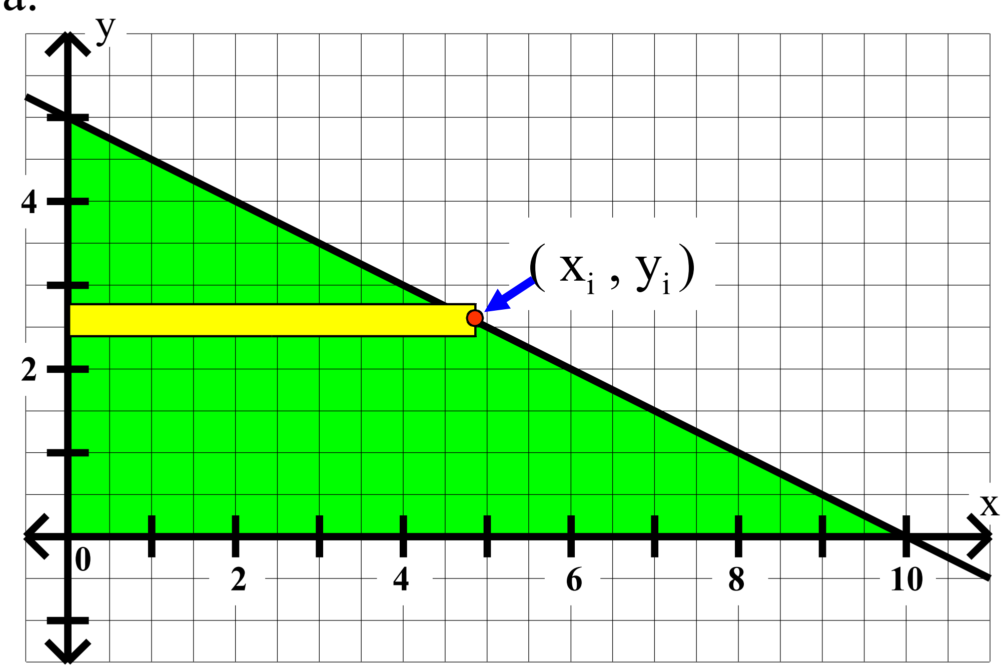

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

c. $V = \pi \int_0 (-2y + 10)^2 \, dy$

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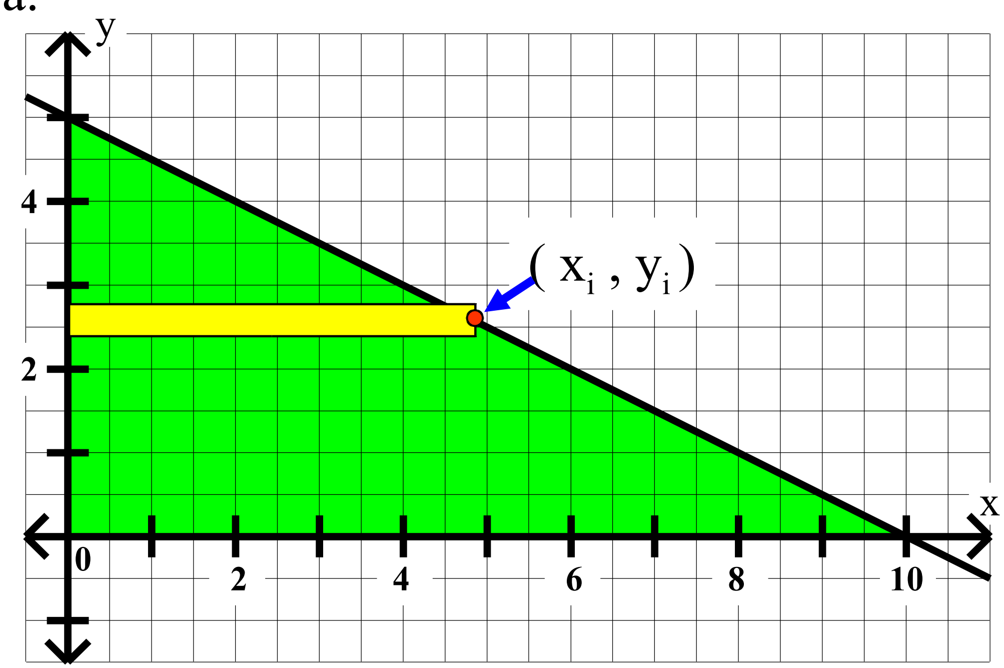

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \, \Delta y$

c. $V = \pi \int_0^5 (-2y + 10)^2 \, dy$

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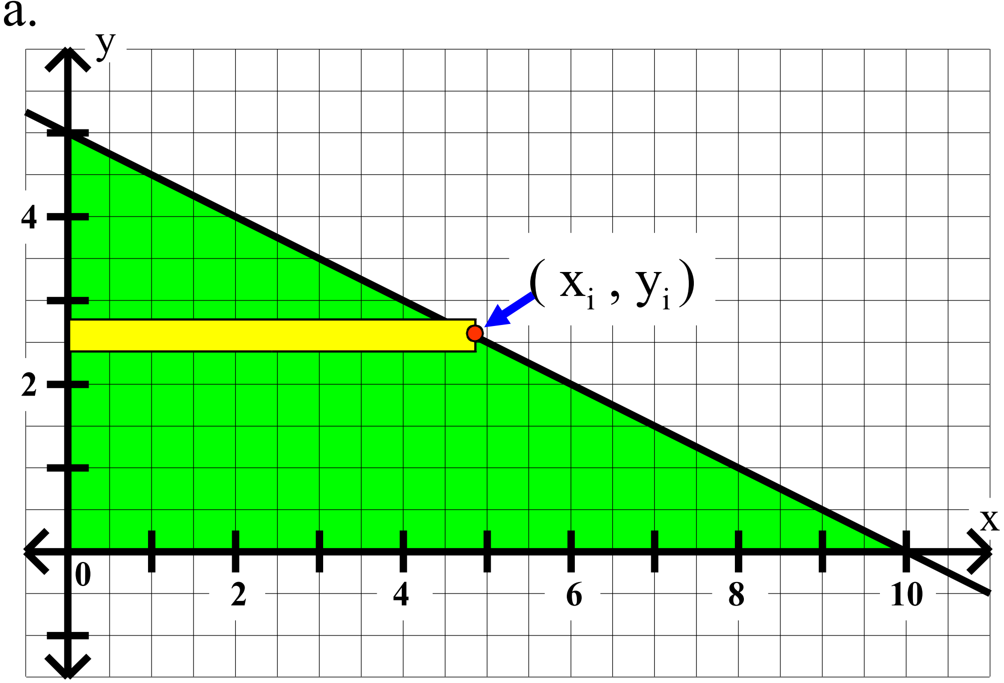

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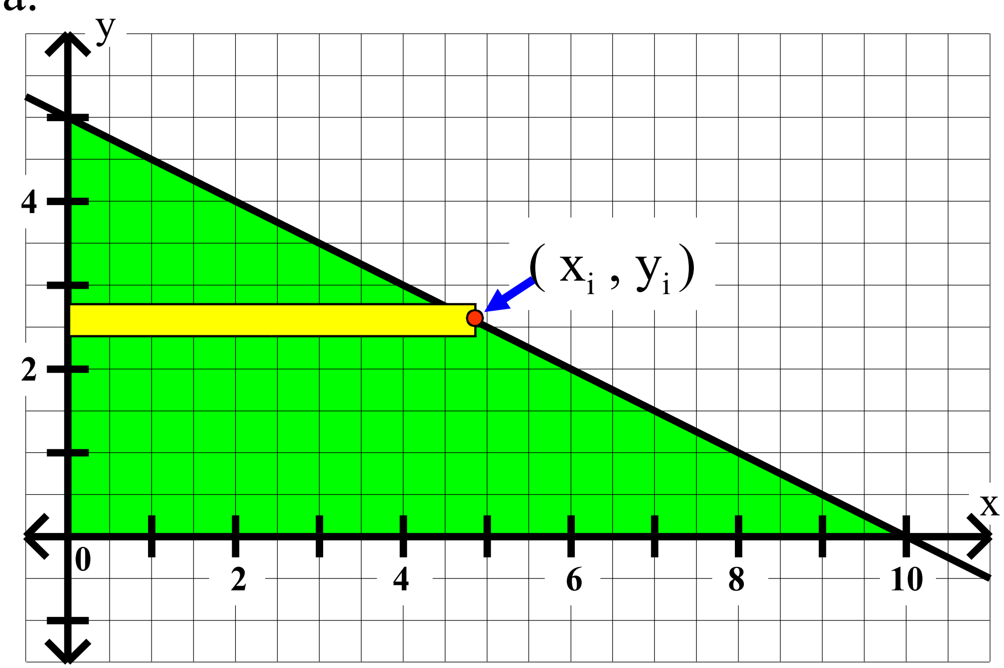

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2\, \Delta y$

c. $V = \pi\int_0^5 (-2y + 10)^2\, dy$

d. $V \approx$

Calculus Class Worksheet #1 Unit 11 Solutions

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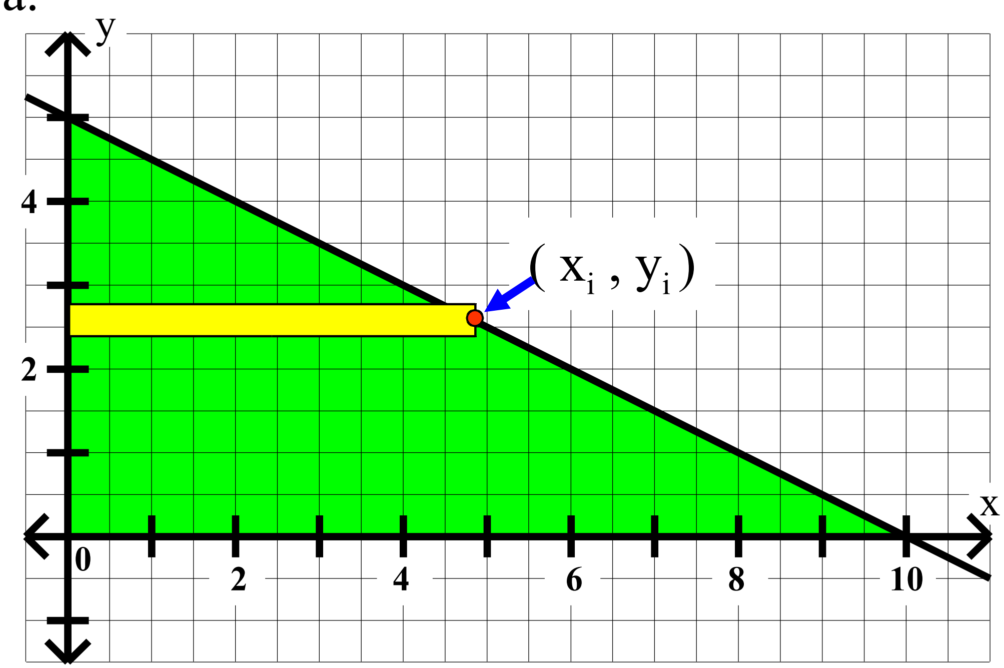

Disks: $V = \pi r^2 h$

$r = x_i = -2y_i + 10$

$h = \Delta y$

b. $V_i = \pi(-2y_i + 10)^2 \Delta y$

c. $V = \pi \int_0^5 (-2y + 10)^2 \, dy$

d. $V \approx 524$ cu. units

Calculus Class Worksheet #1 Unit 11 Solutions

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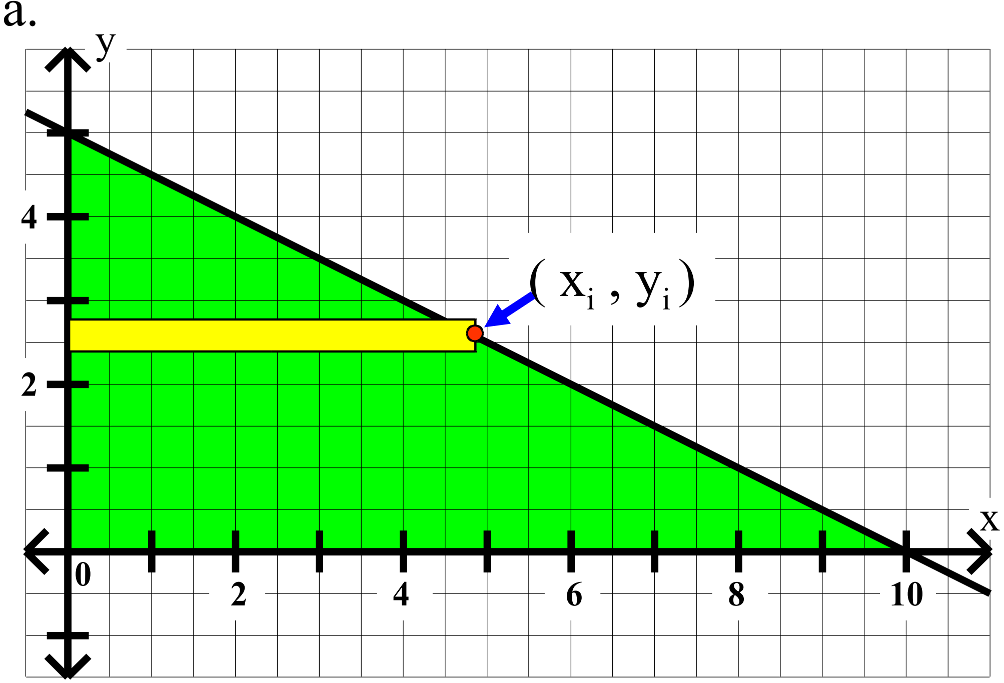

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$h = \Delta y$

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Sample 2a. The region in the first quadrant bounded by $x = y^2$, the x-axis, and the line $x = 9$ is rotated about the x-axis.

Calculus Class Worksheet #1 Unit 11 Solutions

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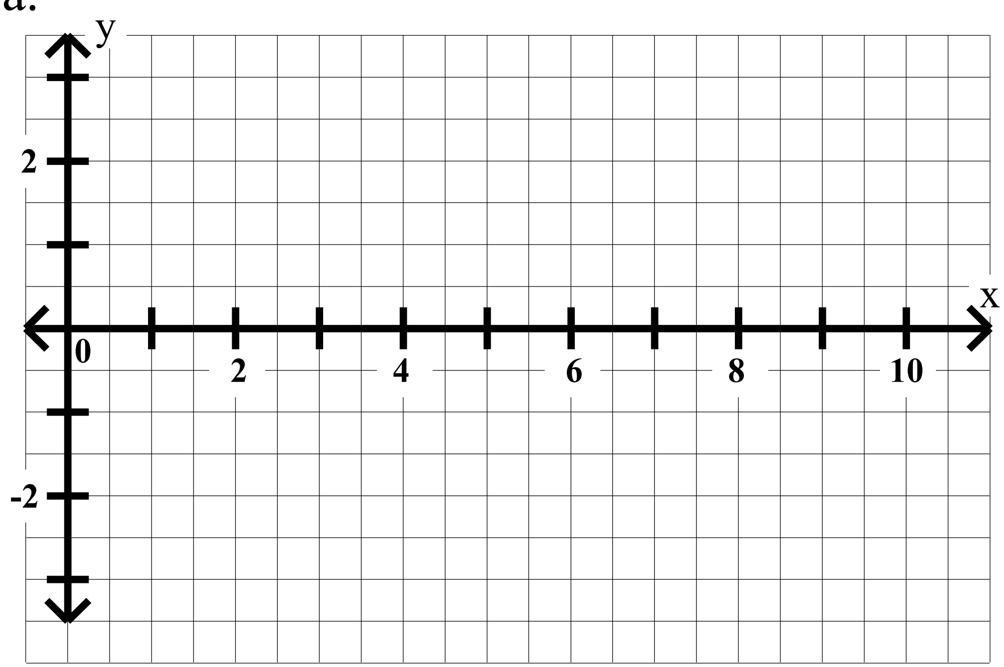

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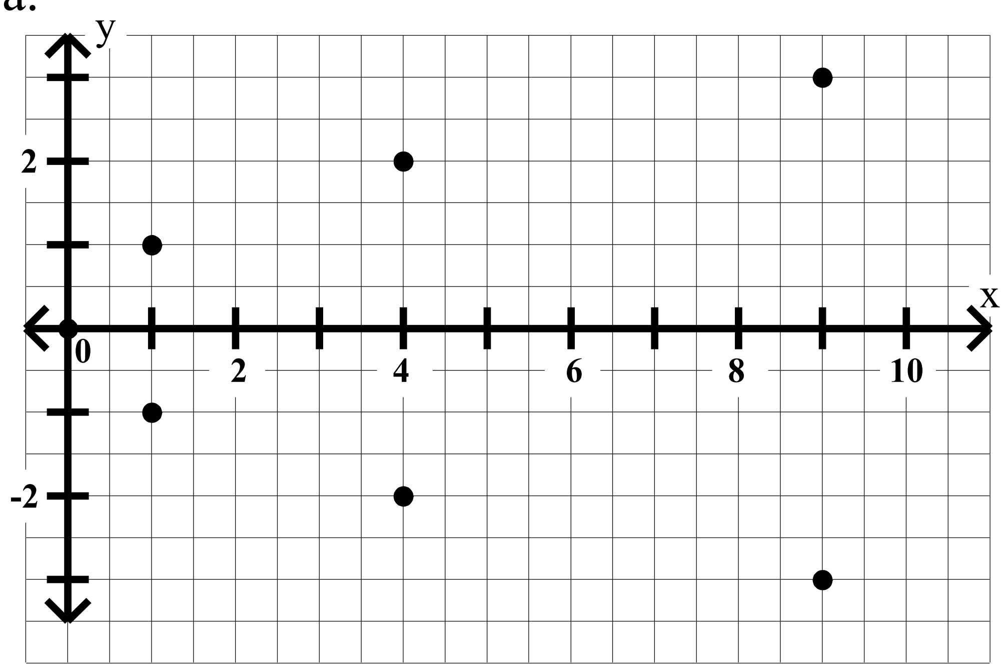

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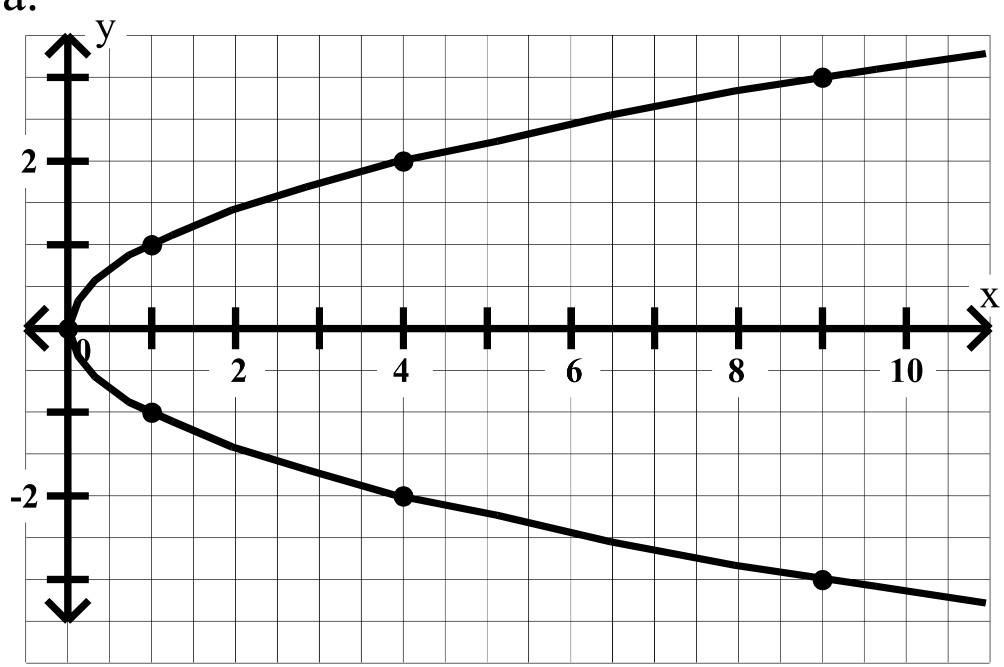

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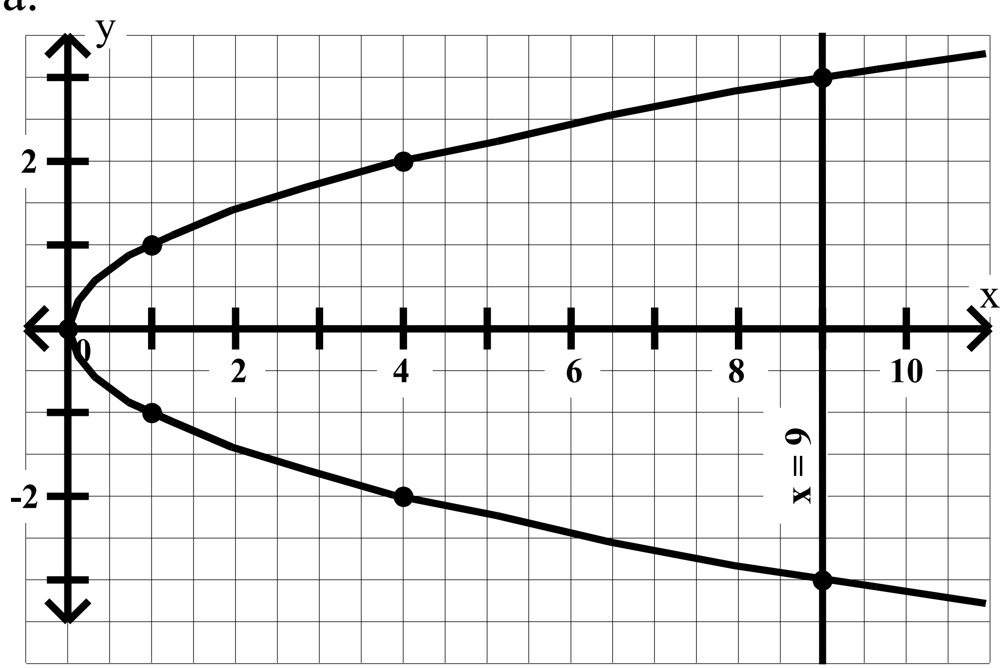

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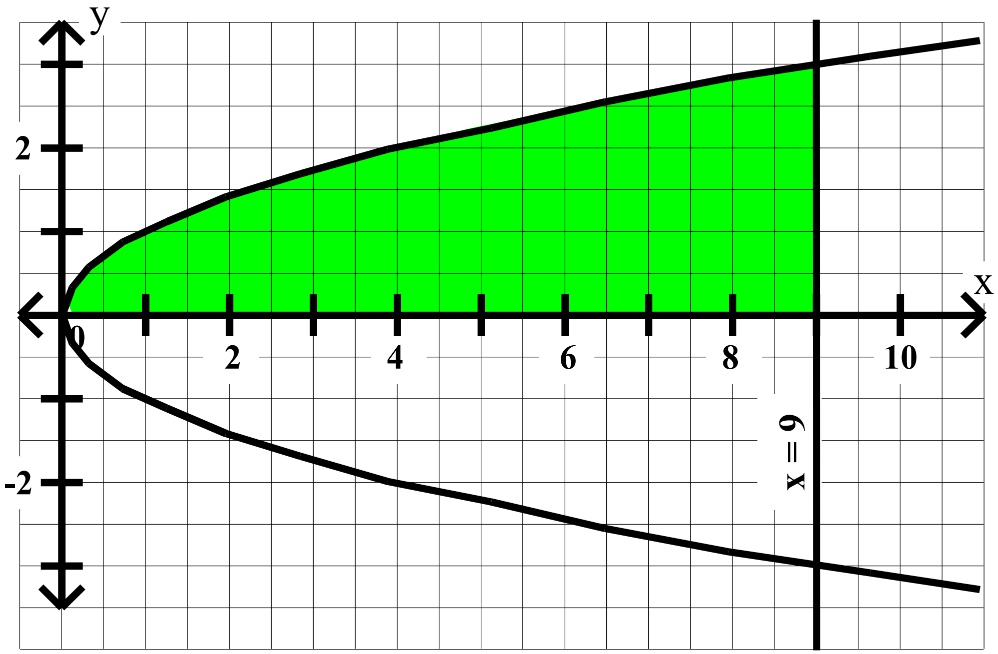

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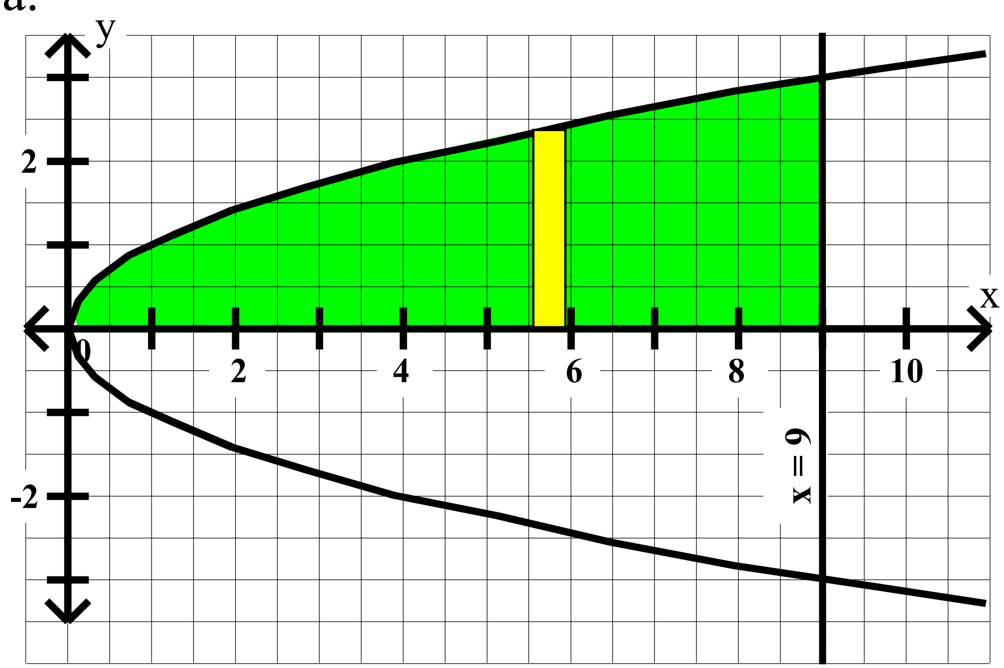

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Sample 2a. The region in the first quadrant bounded by $x = y^2$, the x-axis, and the line $x = 9$ is rotated about the x-axis.

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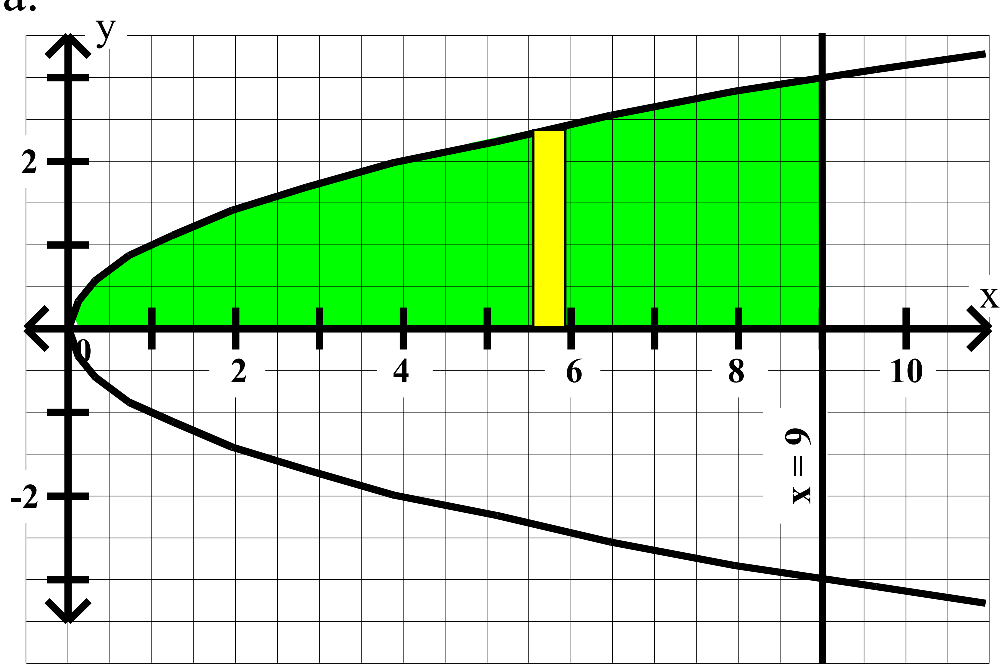

Disks: $V = \pi r^2 h$

$r =$

$h =$

Calculus Class Worksheet #1 Unit 11 Solutions

Use "disks" to find the volume generated by rotating the given region about the given line. For each problem, you must

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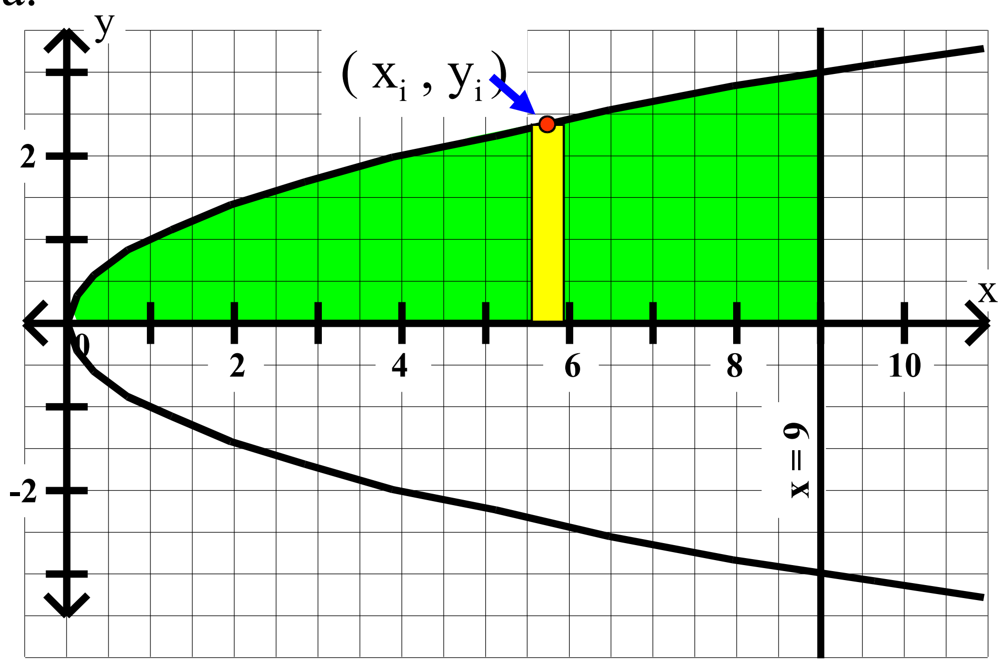

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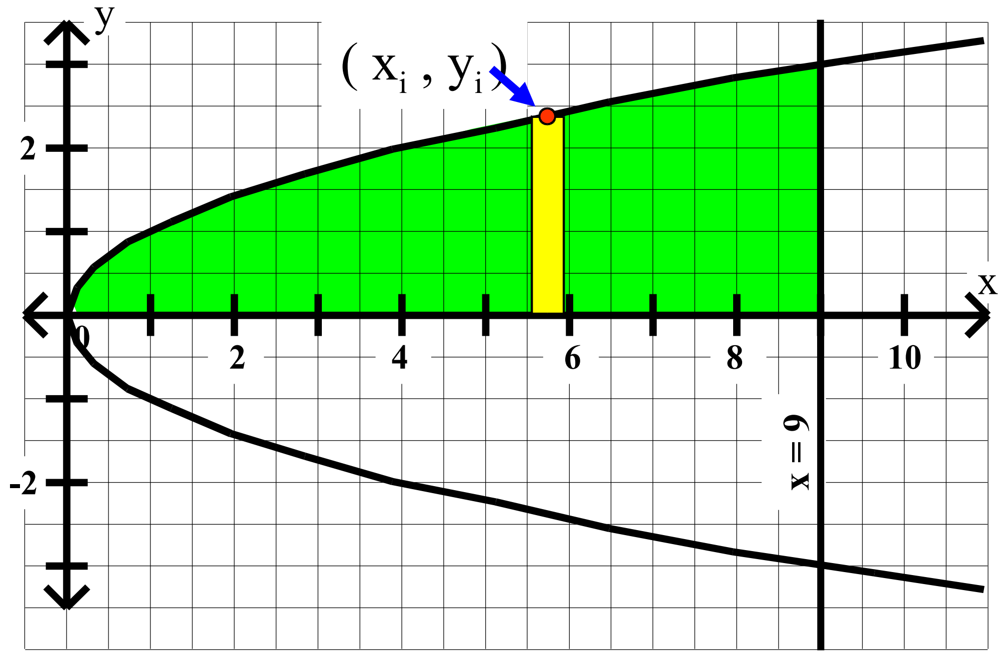

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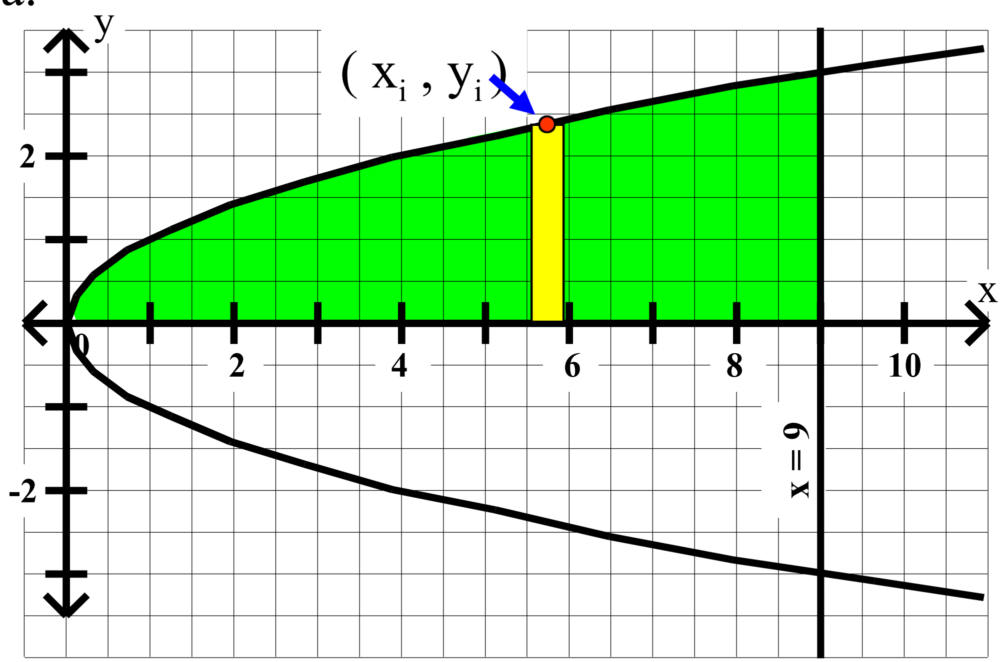

Disks: $V = \pi r^2 h$

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Calculus Class Worksheet #1 Unit 11 Solutions

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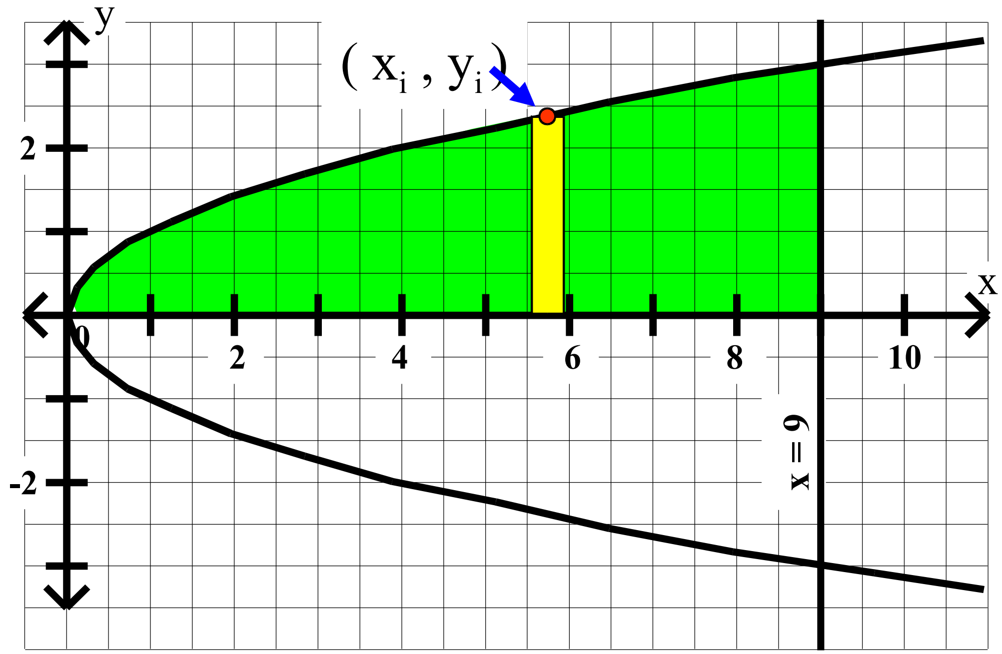

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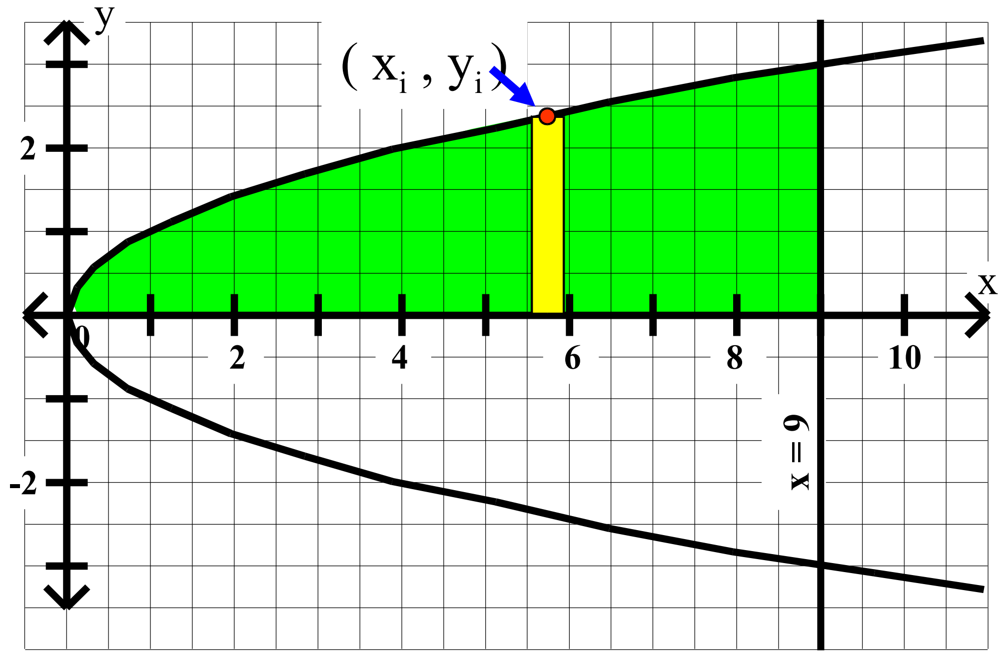

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

Calculus Class Worksheet #1 Unit 11 Solutions

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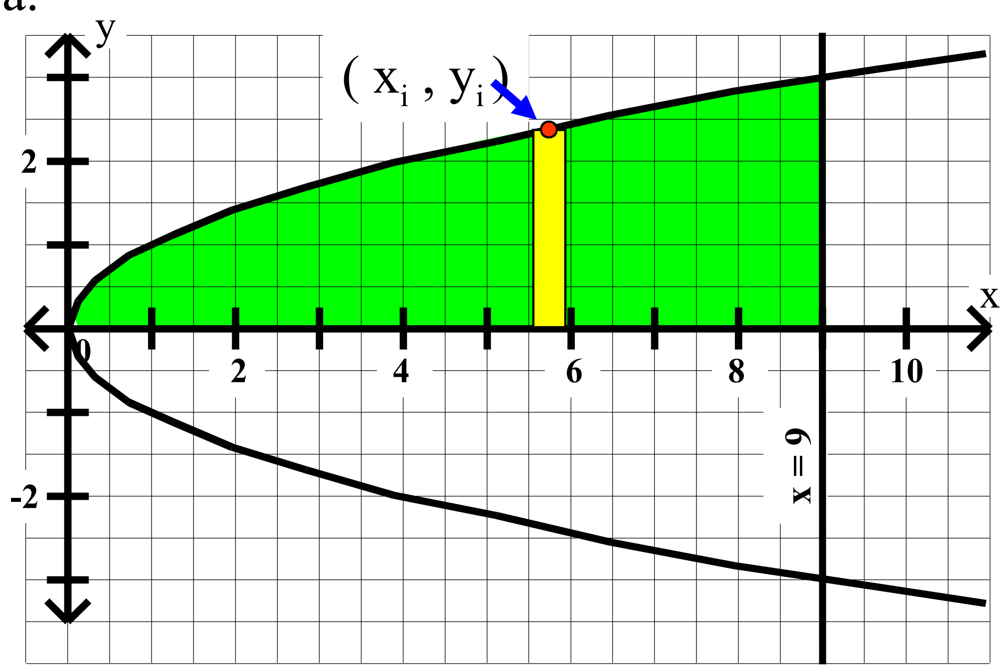

Disks: $V = \pi r^2 h$

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$h = \Delta x$

b. $V_i =$

Calculus Class Worksheet #1 Unit 11 Solutions

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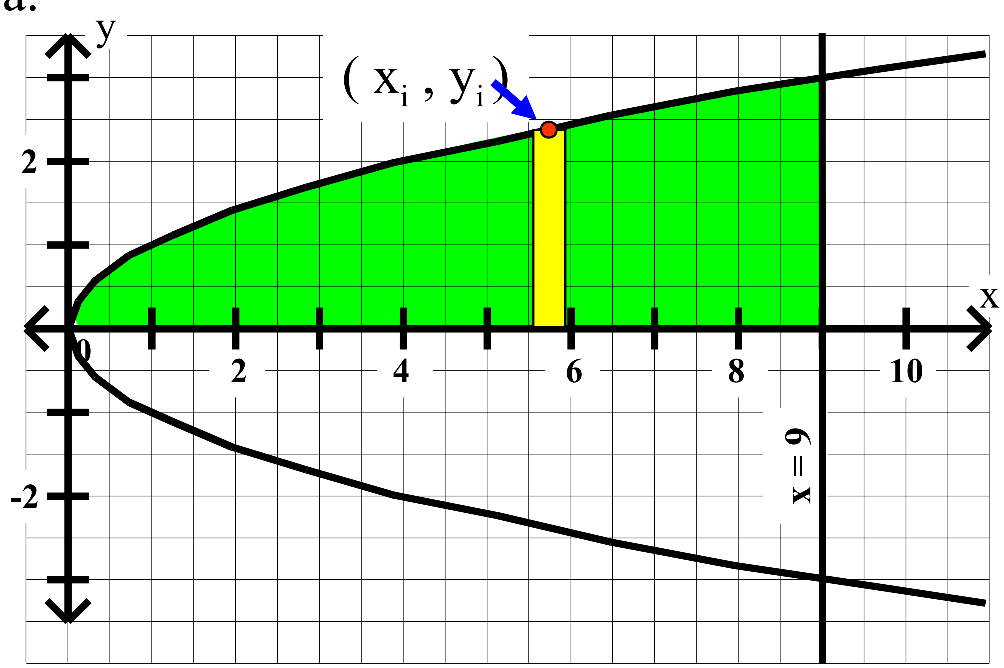

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi$

Calculus Class Worksheet #1   Unit 11   Solutions

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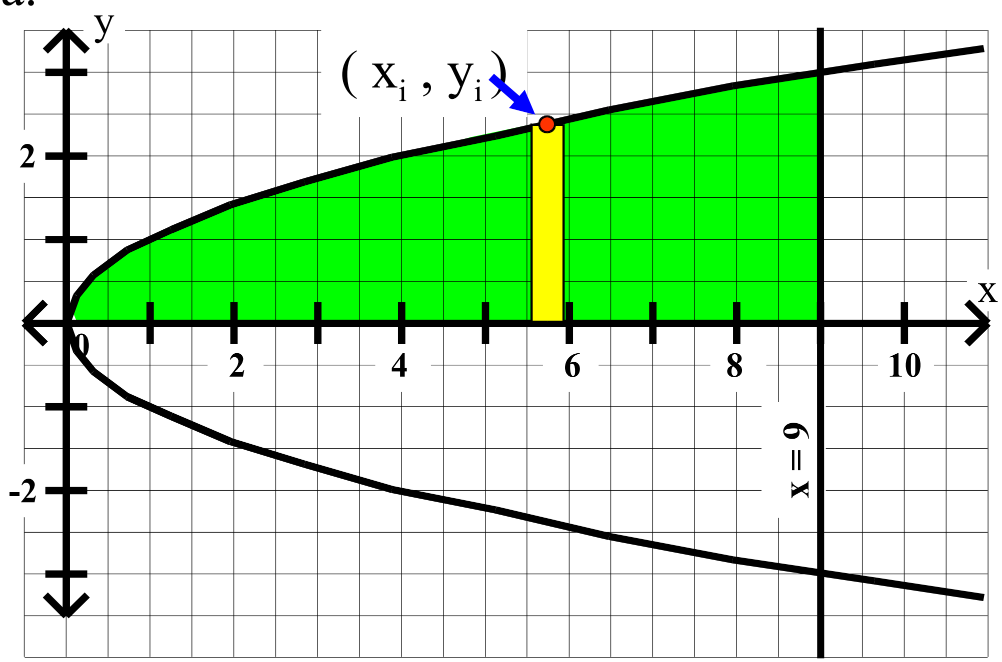

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i}\,)$

Calculus Class Worksheet #1 Unit 11 Solutions

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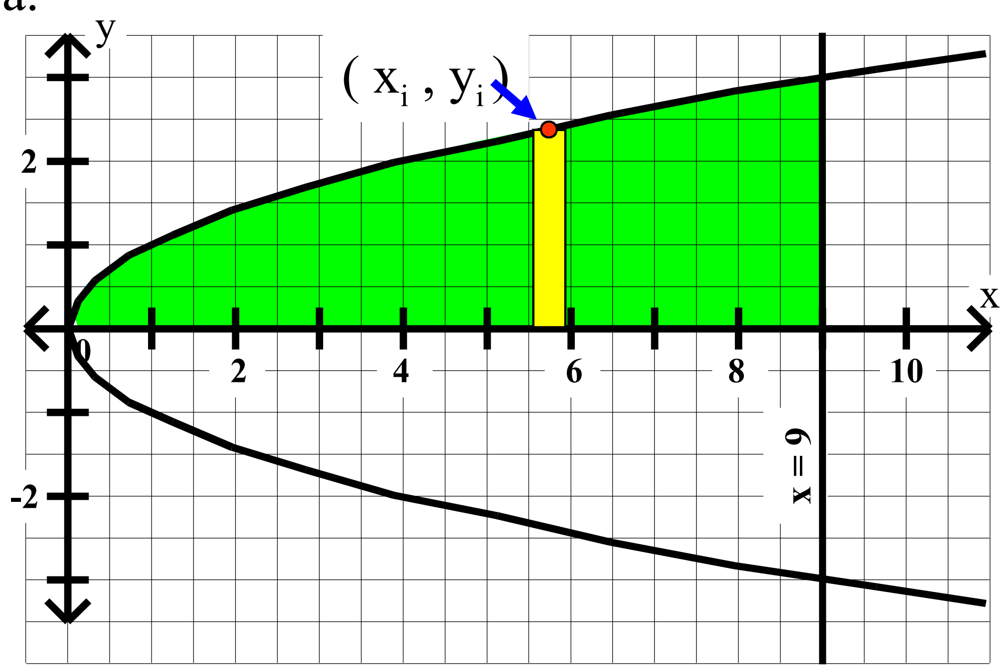

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i}\,)^2$

Calculus Class Worksheet #1   Unit 11   Solutions

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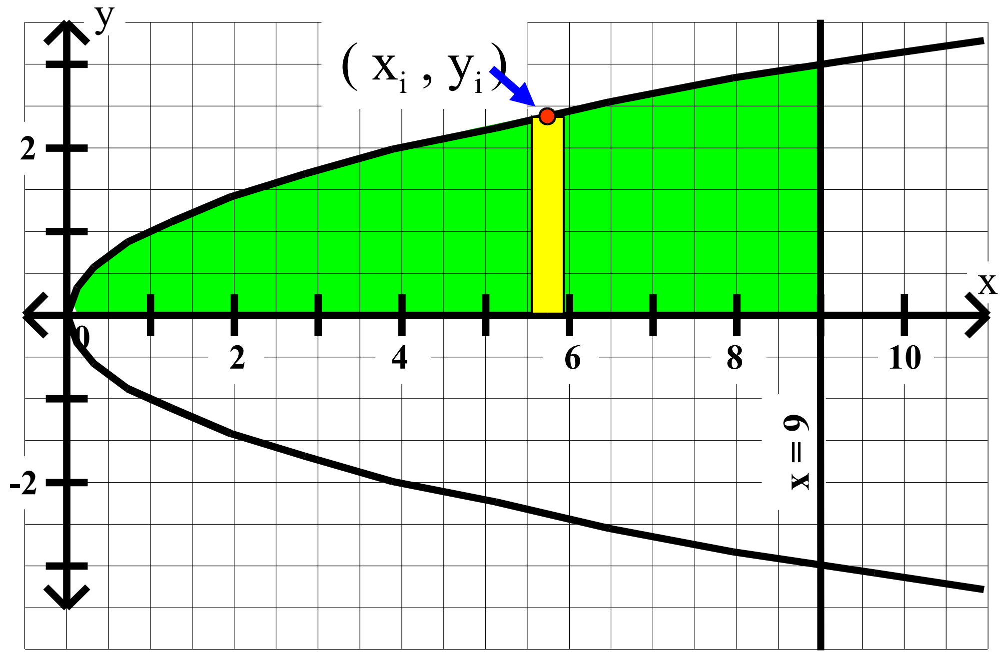

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i})^2 \, \Delta x$

Calculus Class Worksheet #1 Unit 11 Solutions

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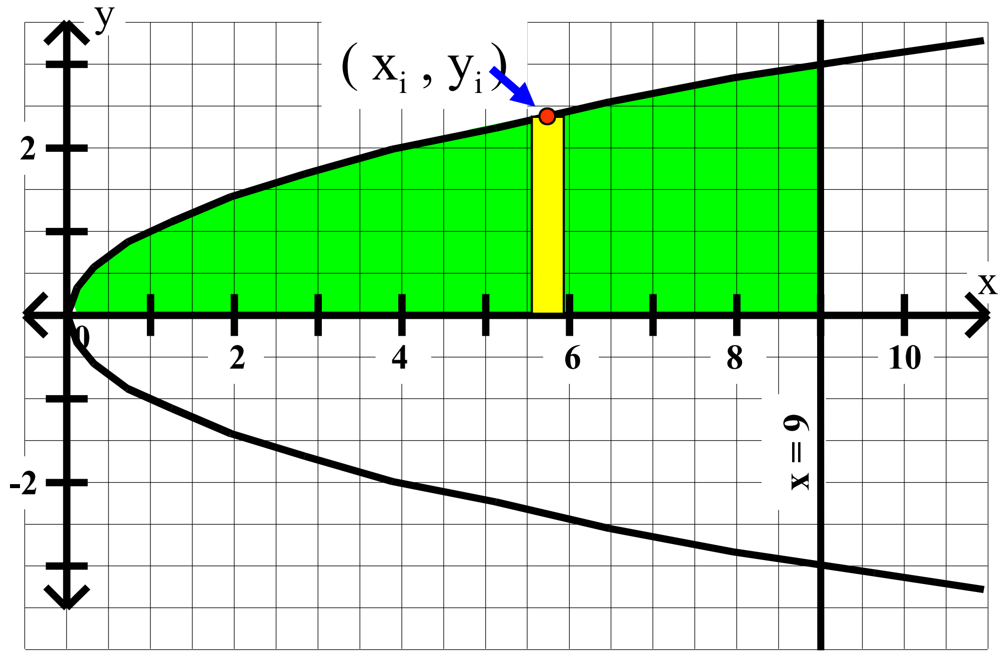

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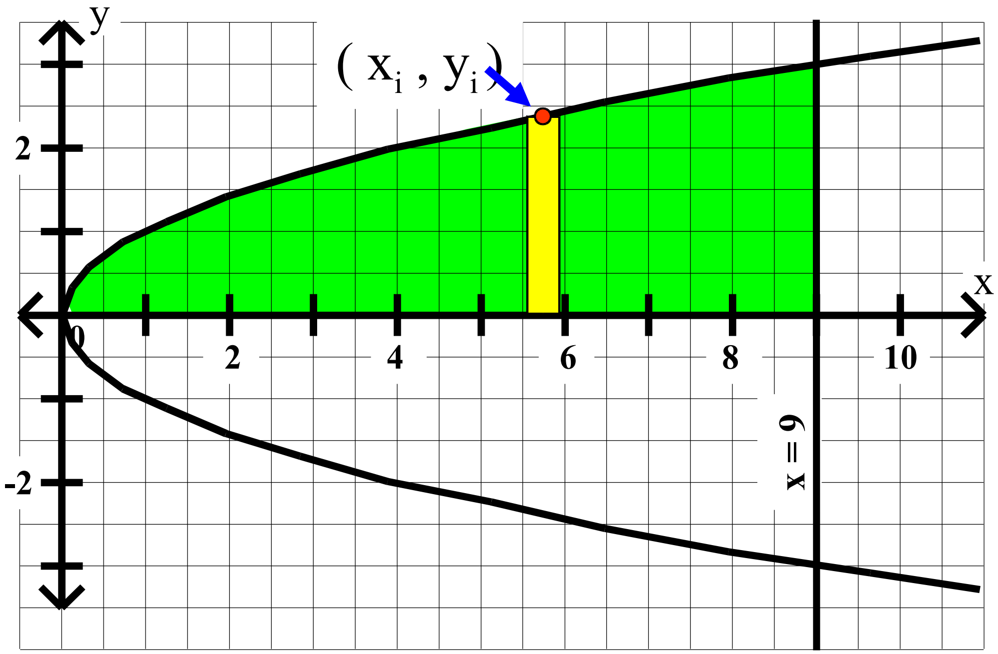

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i})^2 \Delta x$

c. $V =$

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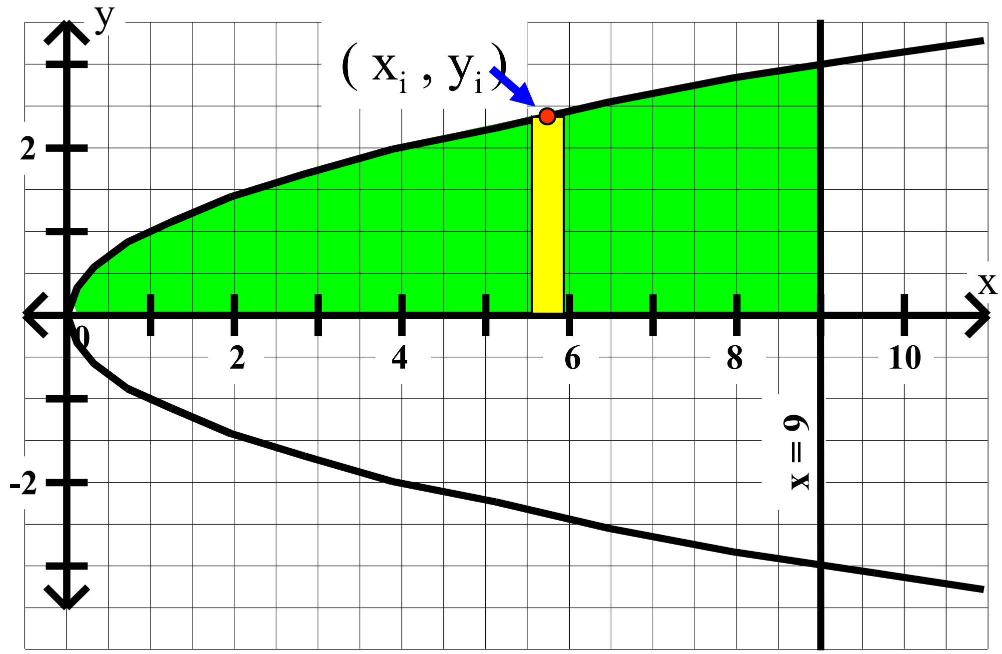

Disks: $V = \pi r^2 h$

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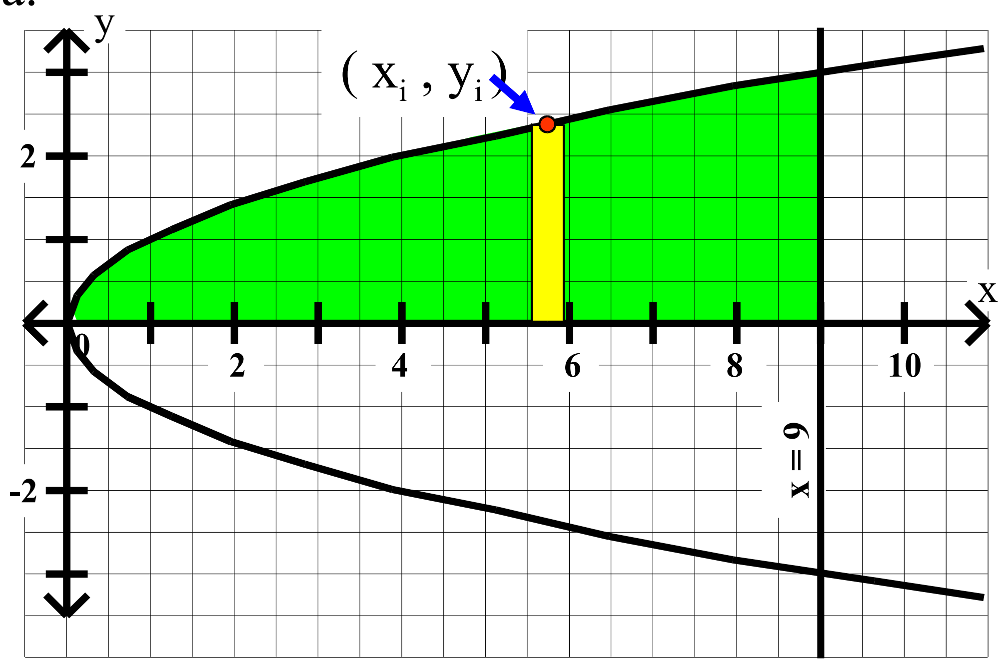

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i})^2 \, \Delta x$

c. $V = \pi \int$

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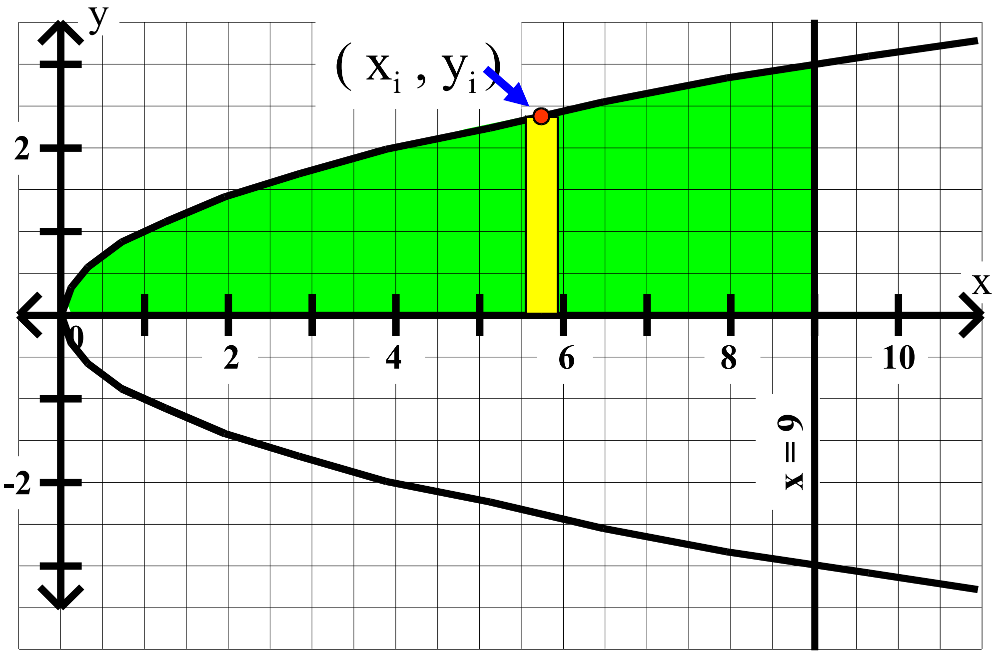

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i}\,)^2 \,\Delta x$

c. $V = \pi\int x \, dx$

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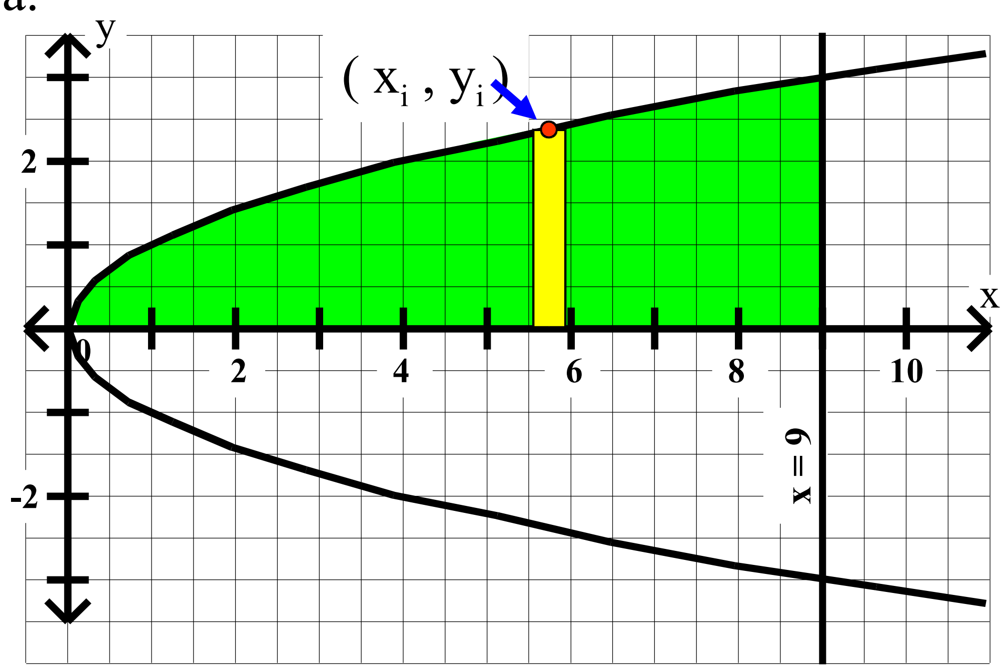

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i})^2 \, \Delta x$

c. $V = \pi\int_0 x \, dx$

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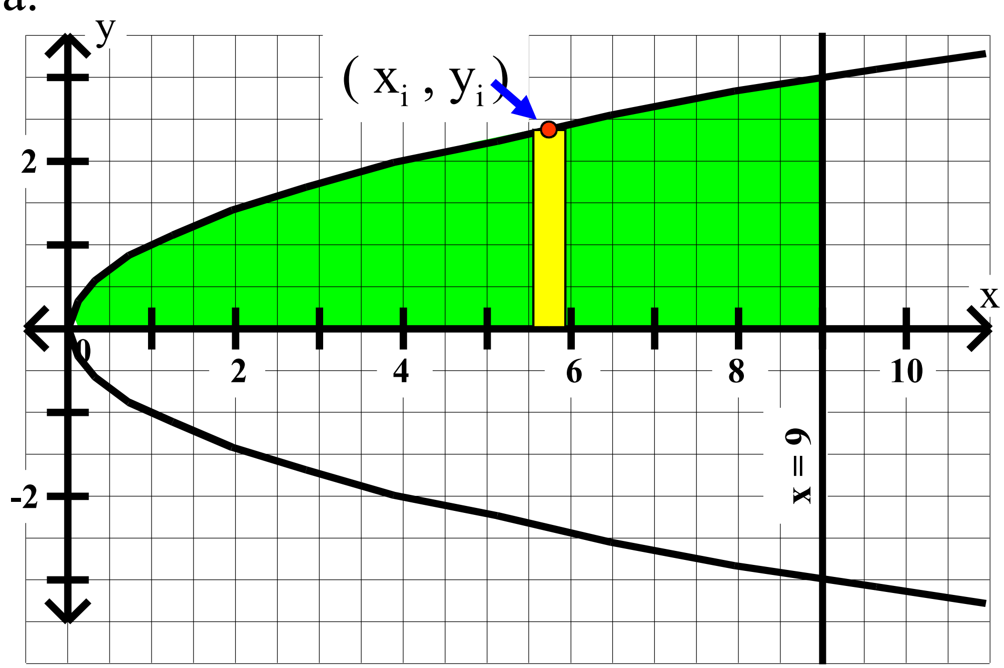

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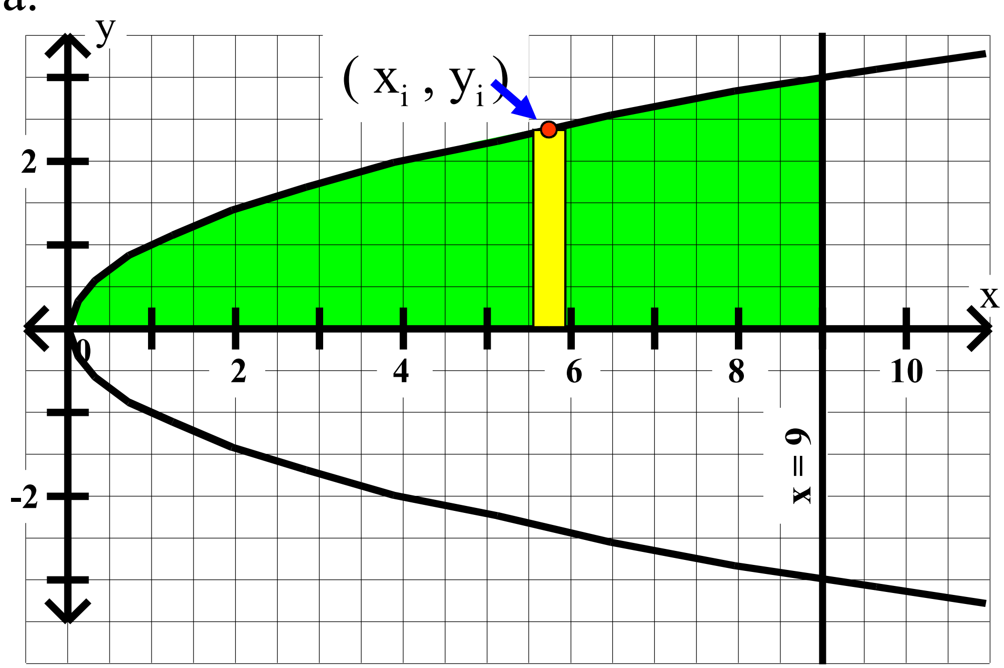

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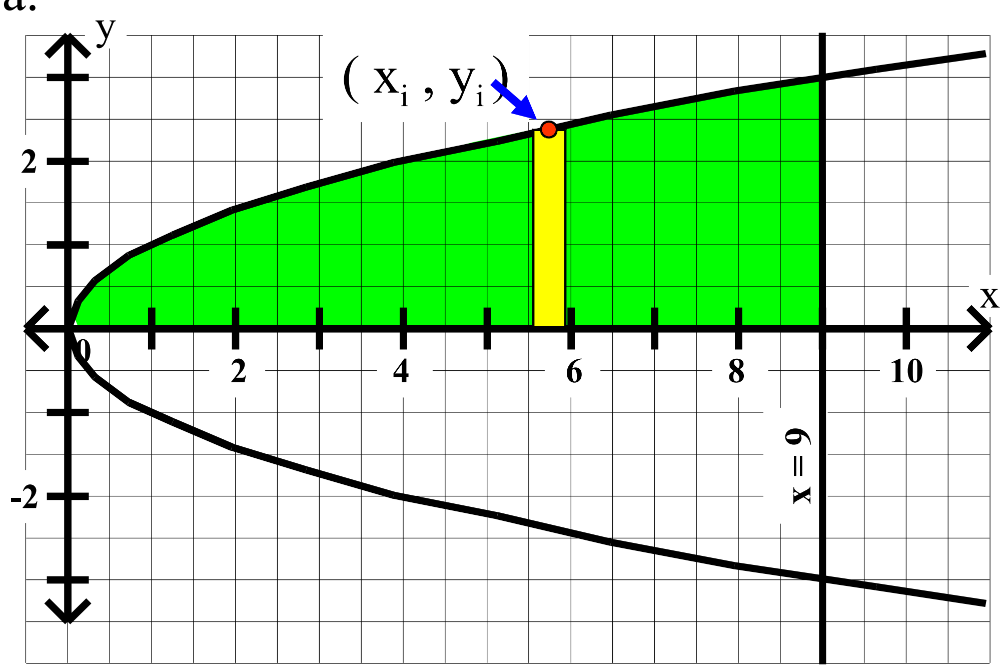

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i}\,)^2\,\Delta x$

c. $V = \pi \int_0^9 x\,dx$

d. $V \approx$

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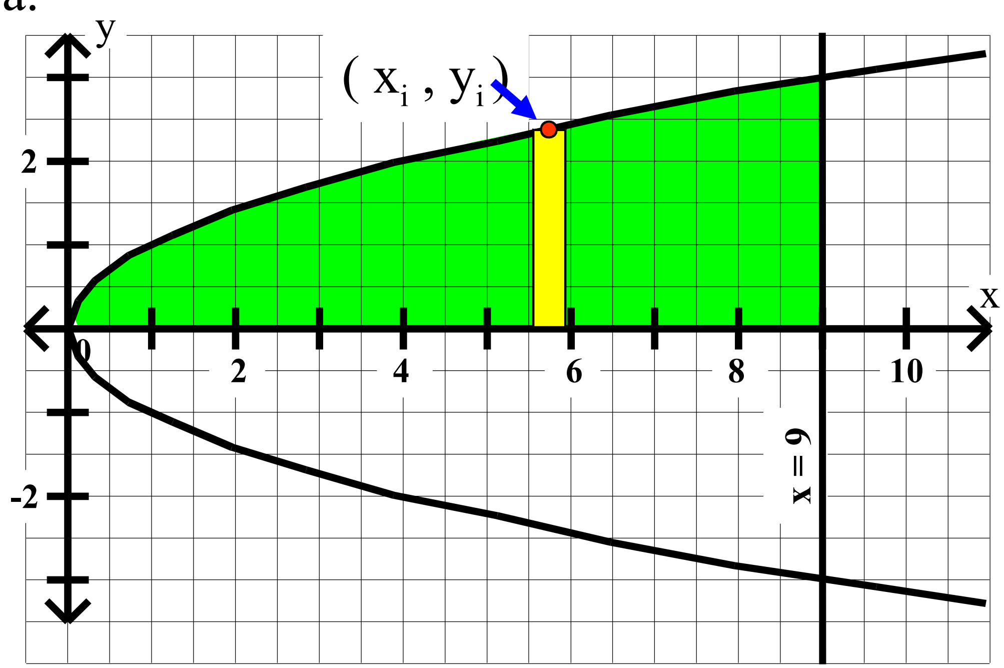

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

b. $V_i = \pi(\sqrt{x_i})^2 \Delta x$

c. $V = \pi\int_0^9 x\, dx$

d. $V \approx 127$ cu. units

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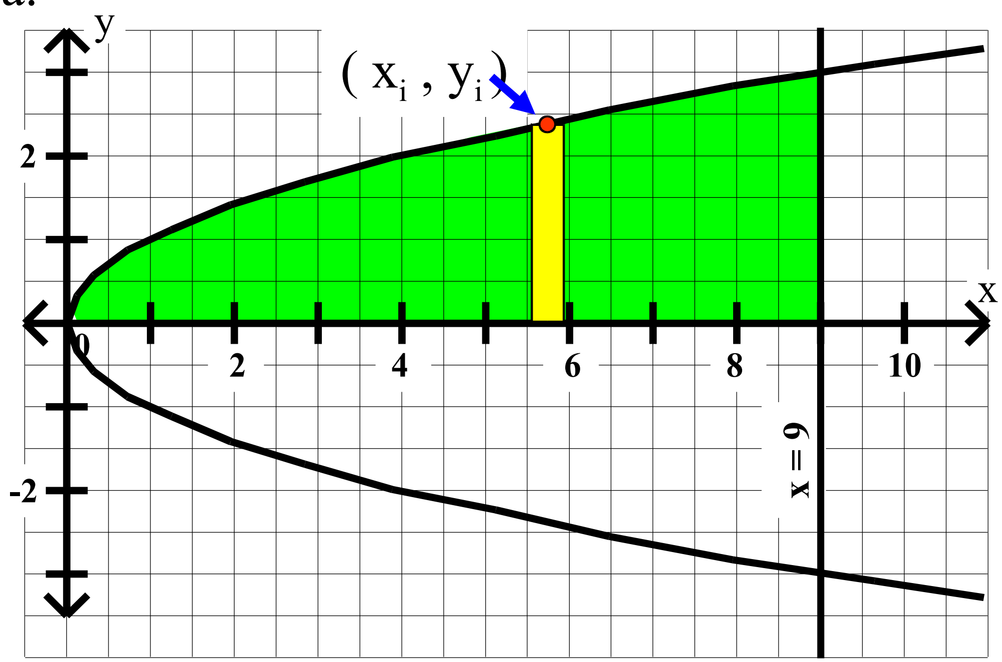

Disks: $V = \pi r^2 h$

$r = y_i = \sqrt{x_i}$

$h = \Delta x$

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Sample 2b. The region in the first quadrant bounded by $x = y^2$, the x-axis, and the line $x = 9$ is rotated about the line $x = 9$.

Calculus Class Worksheet #1 Unit 11 Solutions

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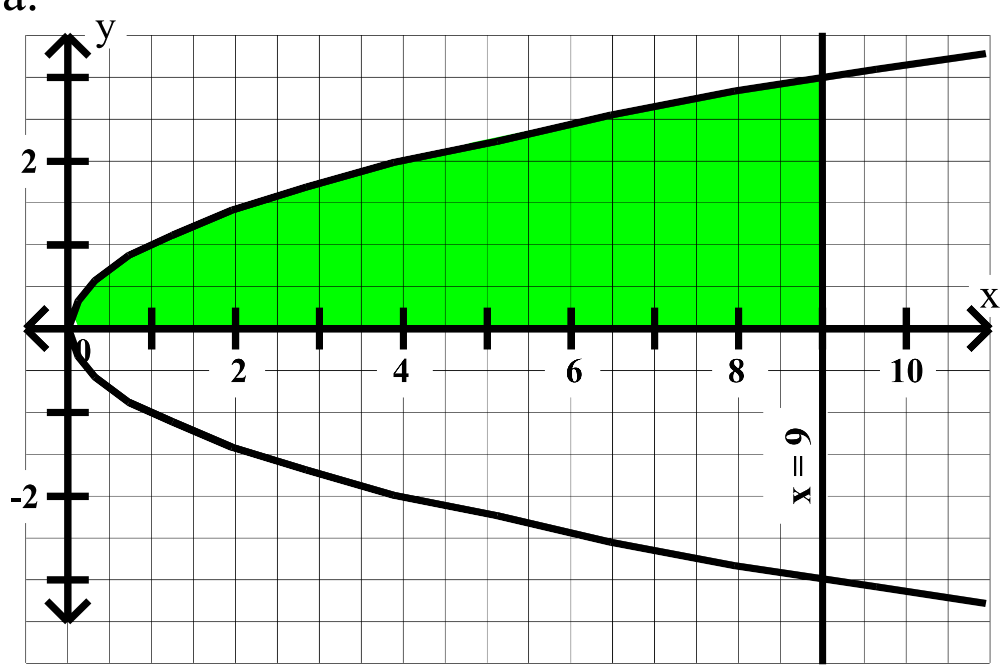

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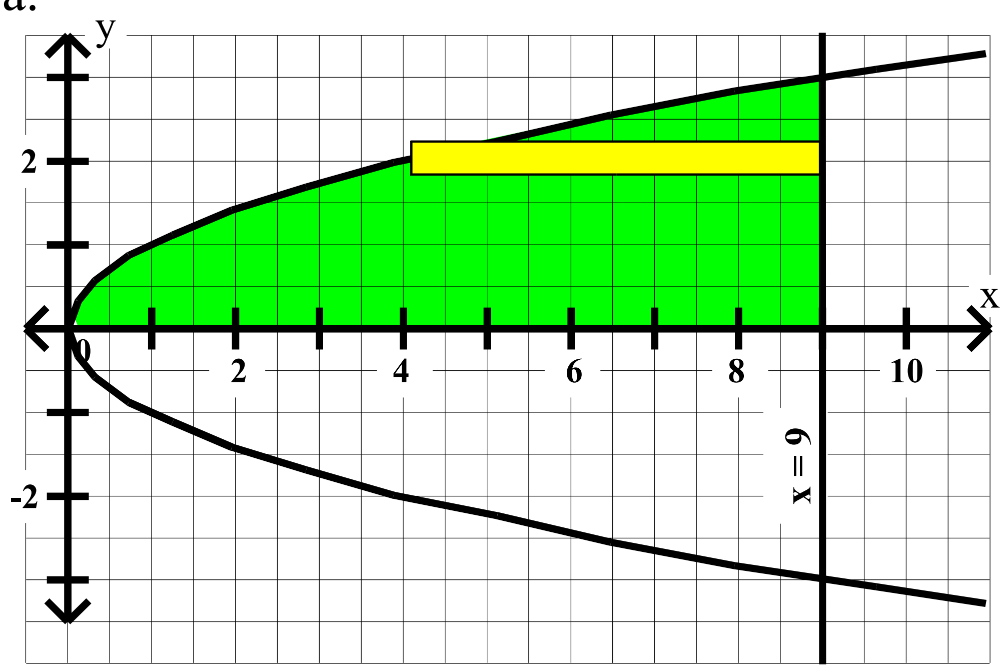

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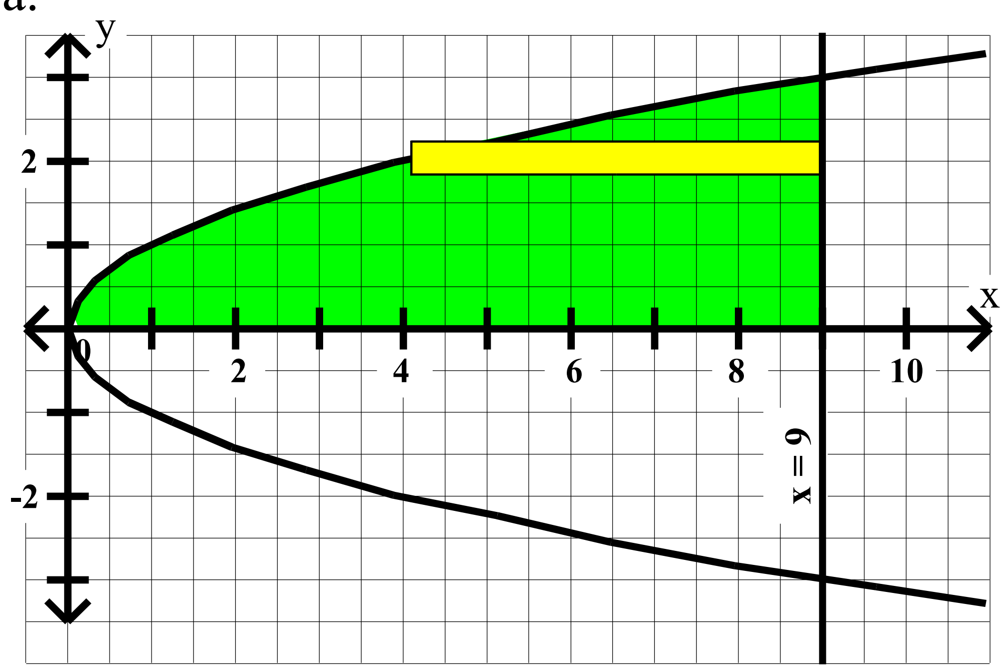

Disks: $V = \pi r^2 h$

r =

h =

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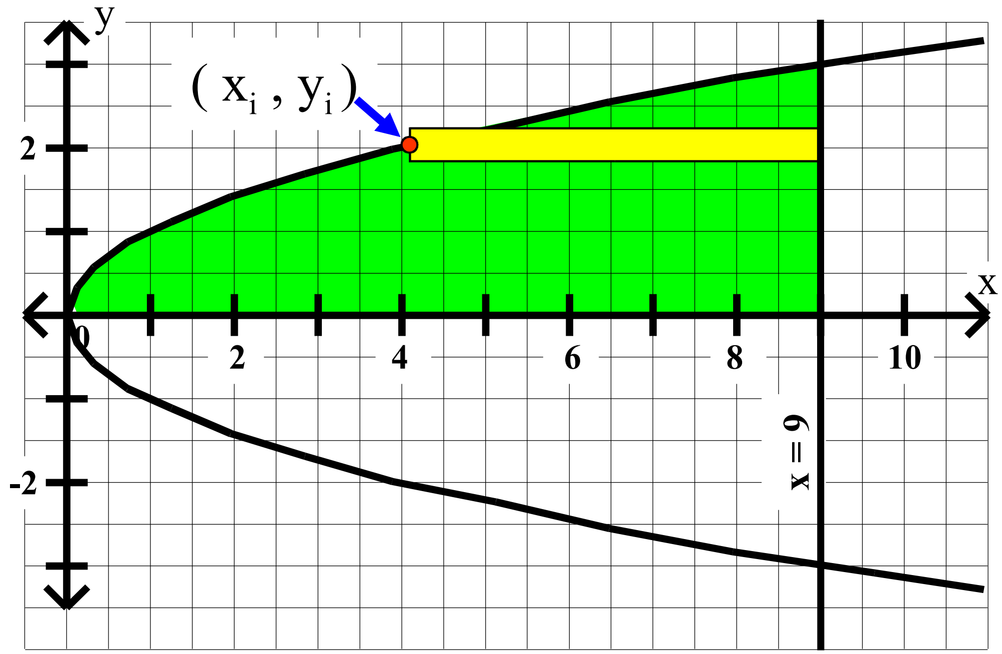

Disks: $V = \pi r^2 h$

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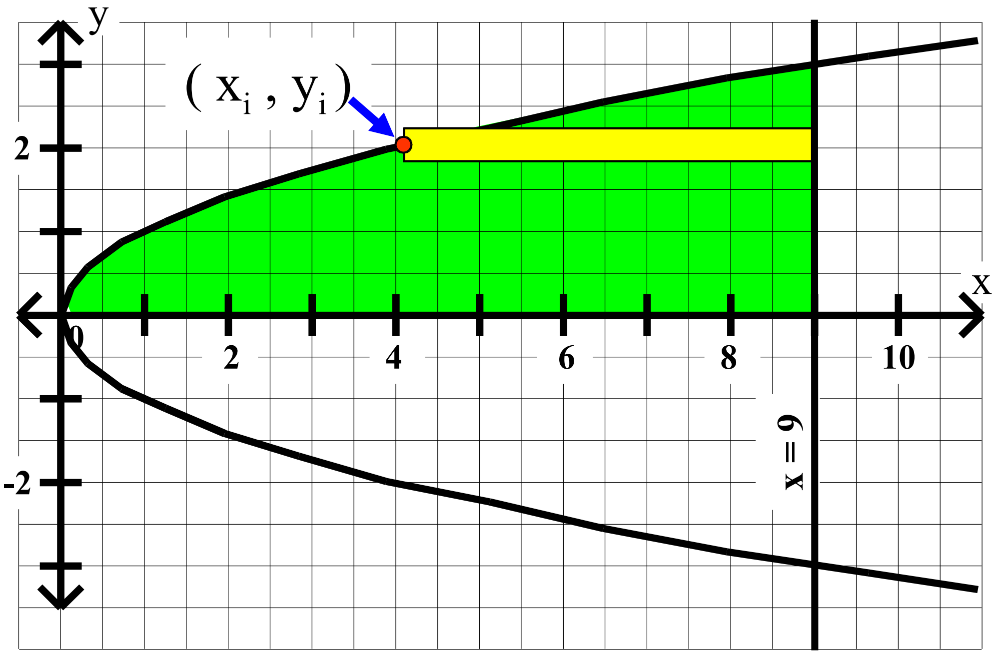

Disks: $V = \pi r^2 h$

$r = 9 - x_i$

$h =$

Calculus Class Worksheet #1 Unit 11 Solutions

Use "disks" to find the volume generated by rotating the given region about the given line. For each problem, you must

a) sketch the generating region, showing a typical generating rectangle,
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Sample 2b. The region in the first quadrant bounded by $x = y^2$, the x-axis, and the line $x = 9$ is rotated about the line $x = 9$.

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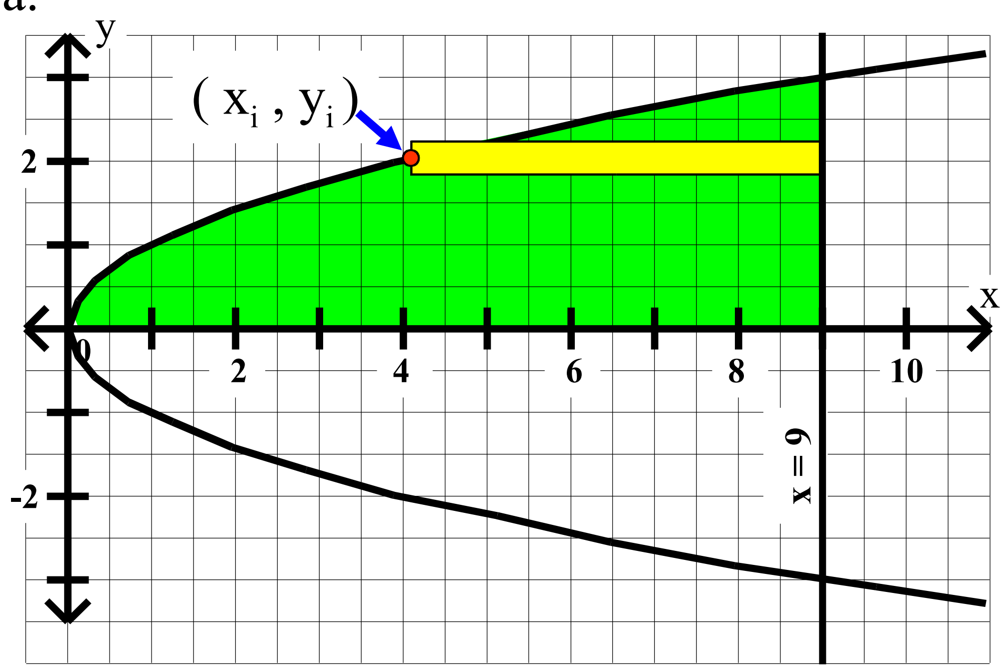

Disks: $V = \pi r^2 h$

$r = 9 - x_i$

$h = \Delta y$

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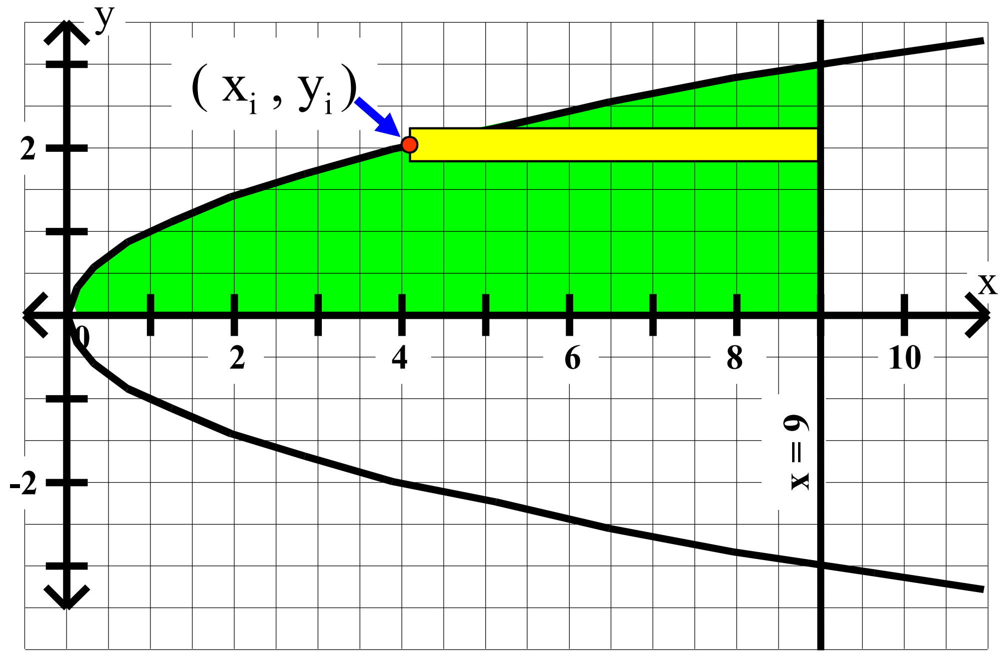

Disks: $V = \pi r^2 h$

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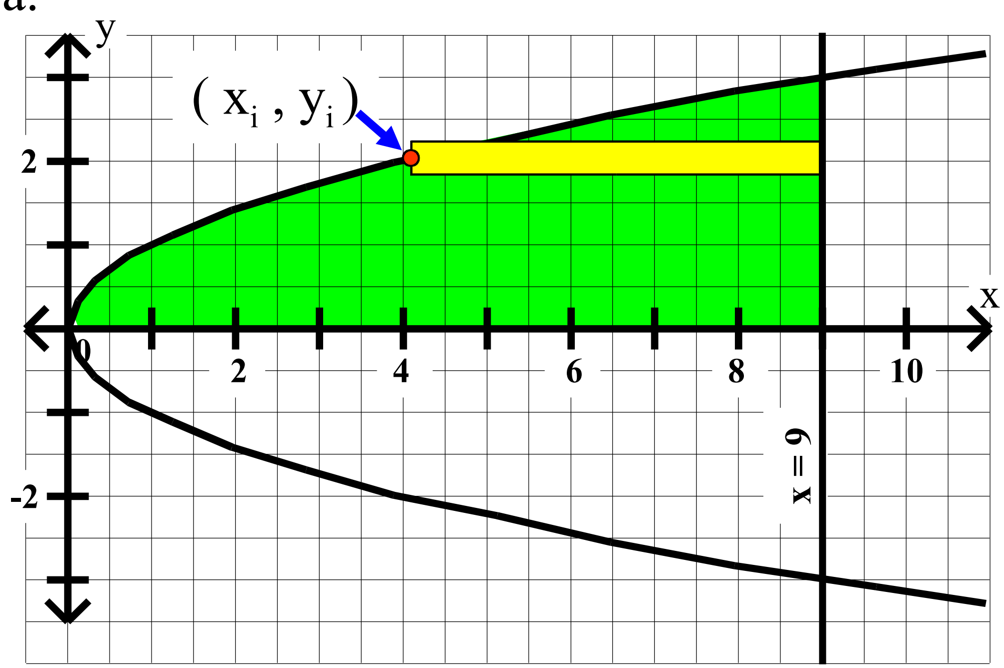

Disks: $V = \pi r^2 h$

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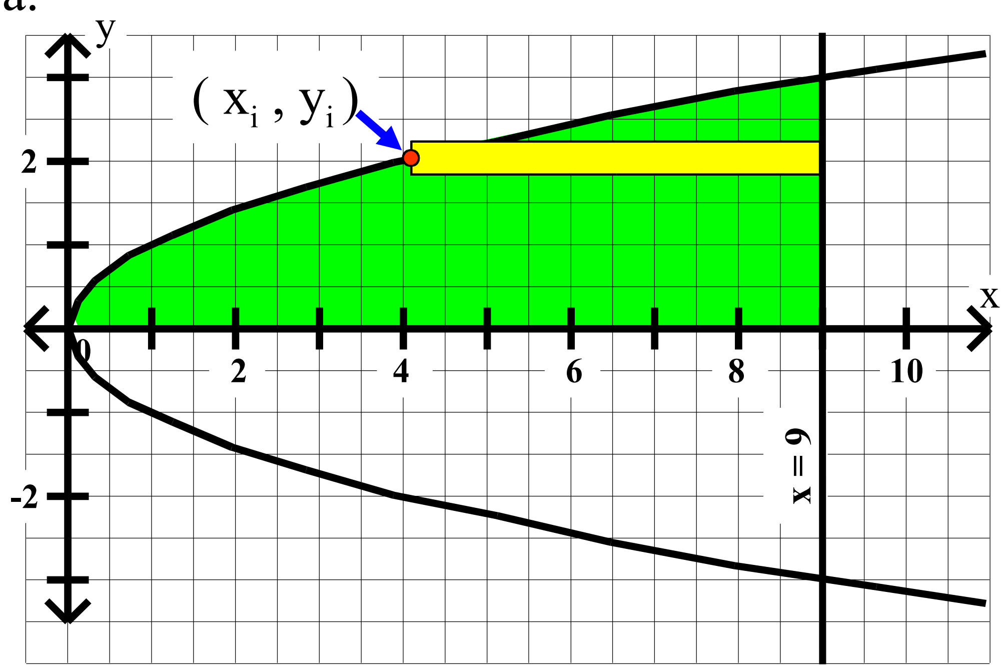

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i =$

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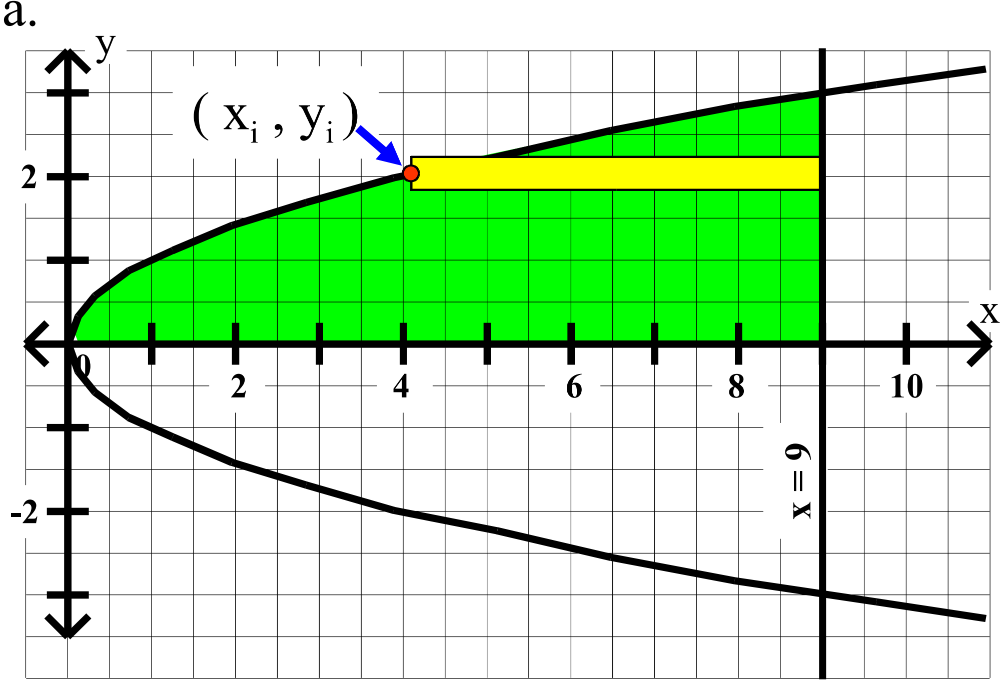

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

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b. $V_i = \pi$

Calculus Class Worksheet #1 Unit 11 Solutions

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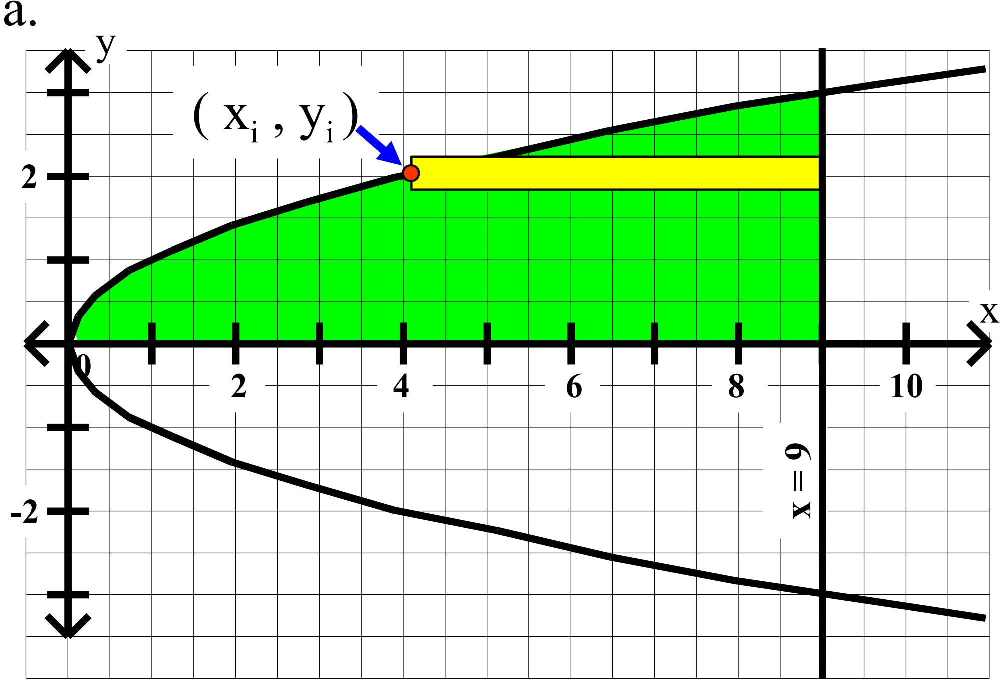

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

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b. $V_i = \pi(9 - y_i^2)$

Calculus Class Worksheet #1 Unit 11 Solutions

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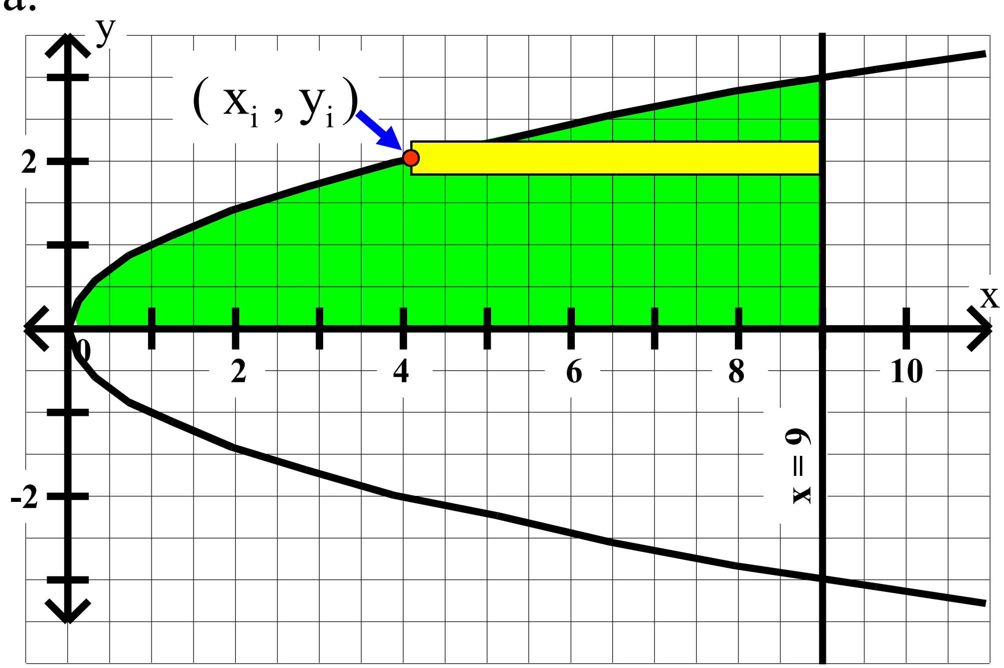

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2$

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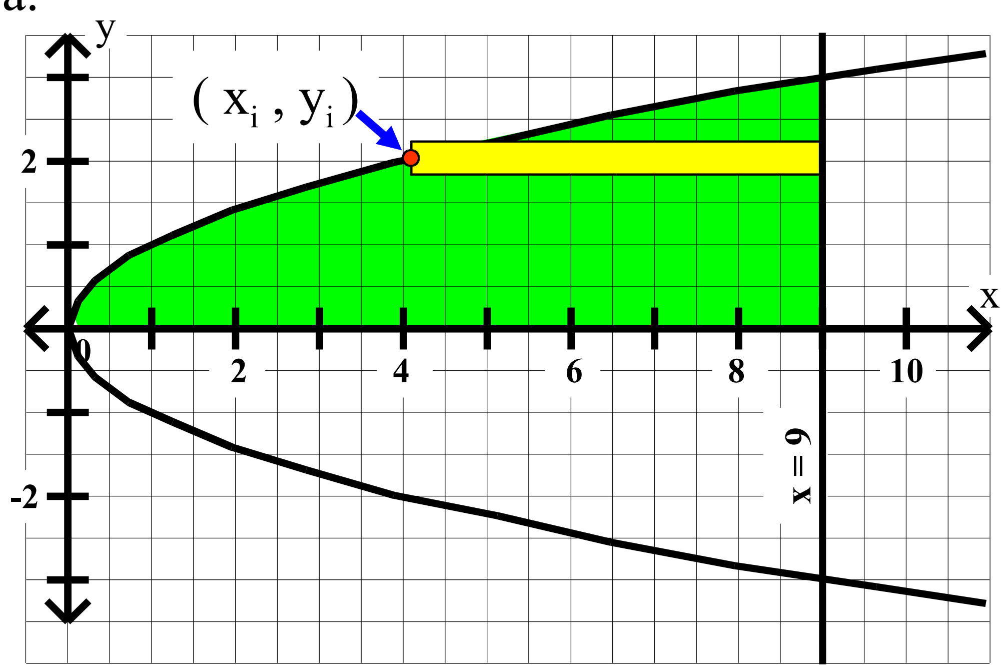

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

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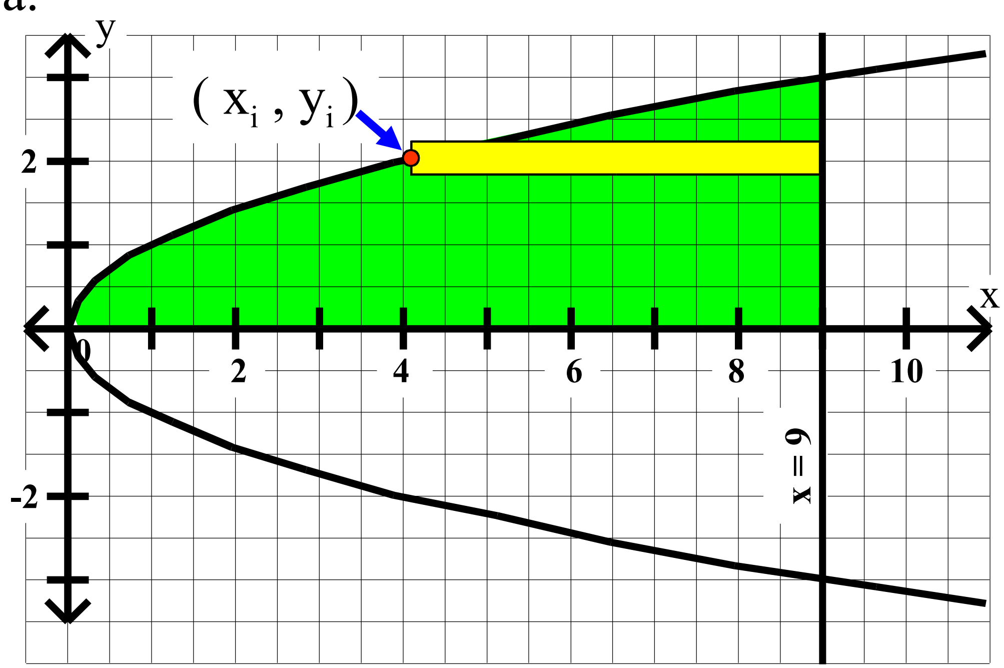

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \, \Delta y$

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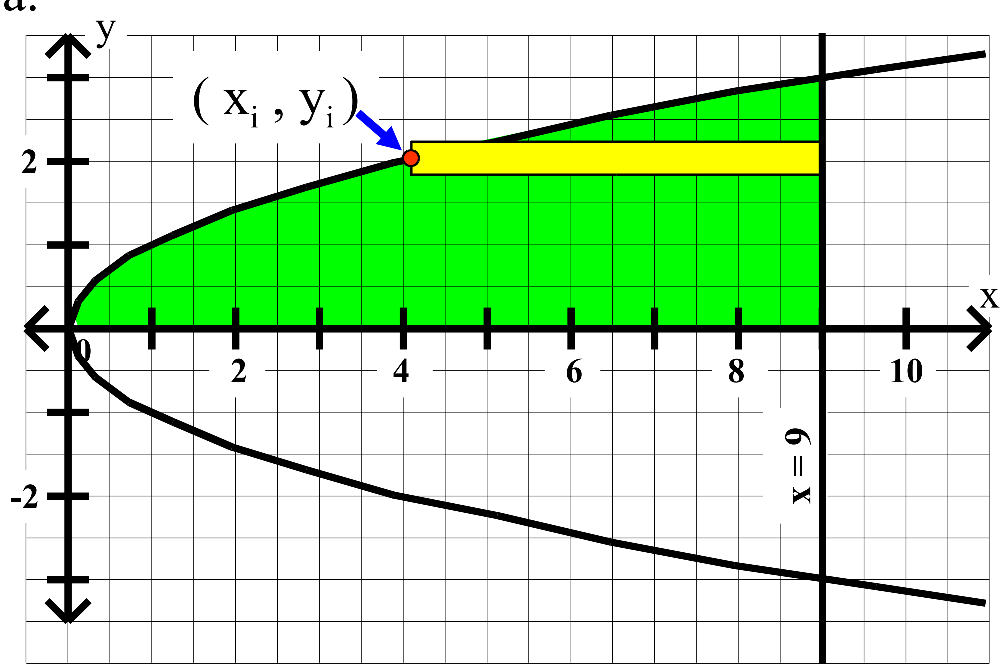

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V =$

Calculus Class Worksheet #1   Unit 11   Solutions

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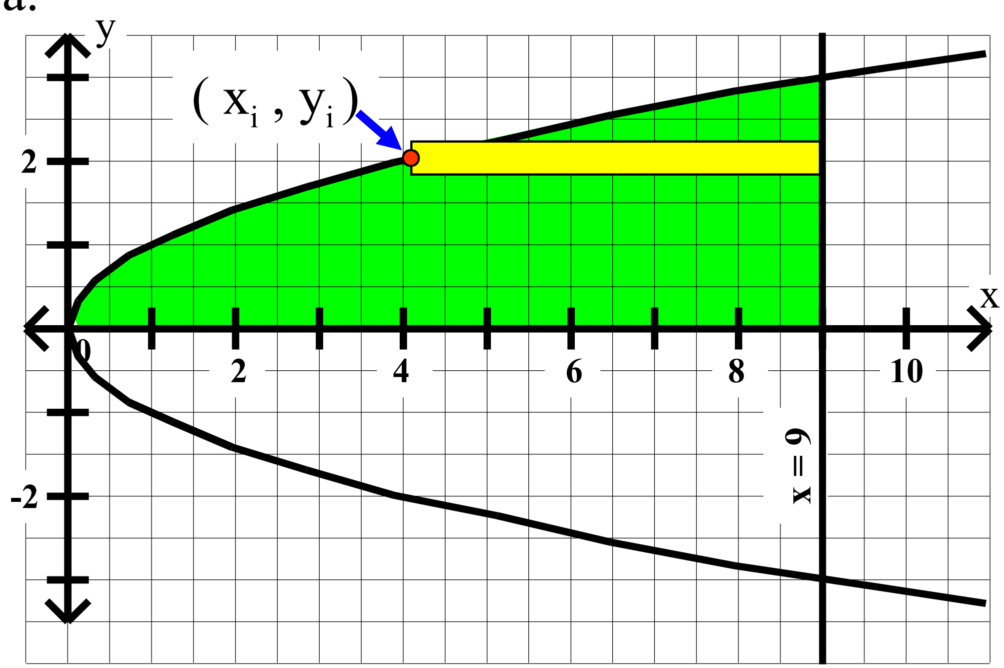

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V = \pi$

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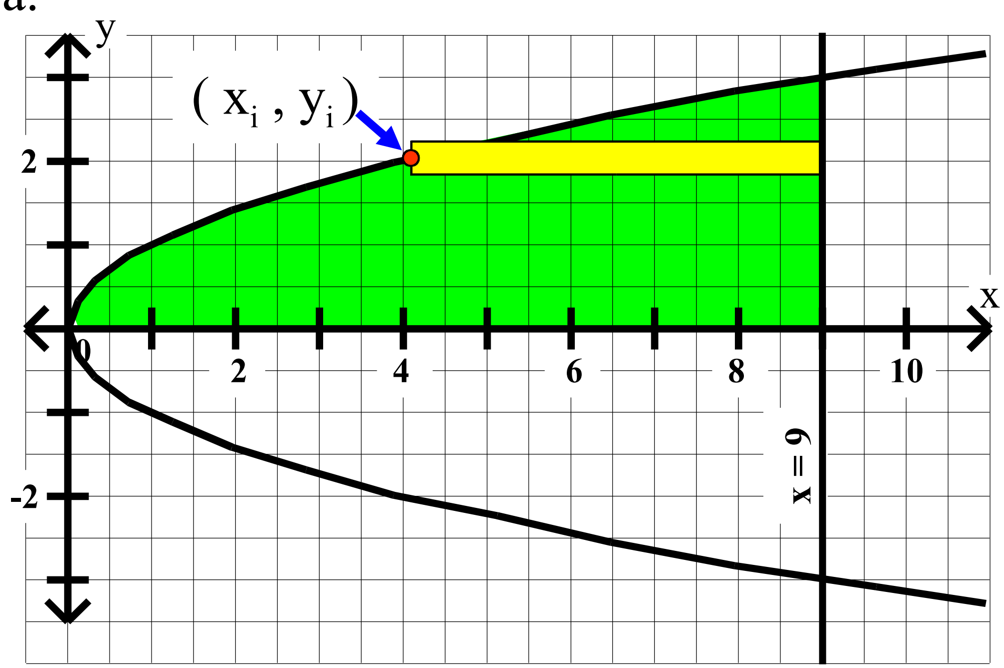

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V = \pi \int$

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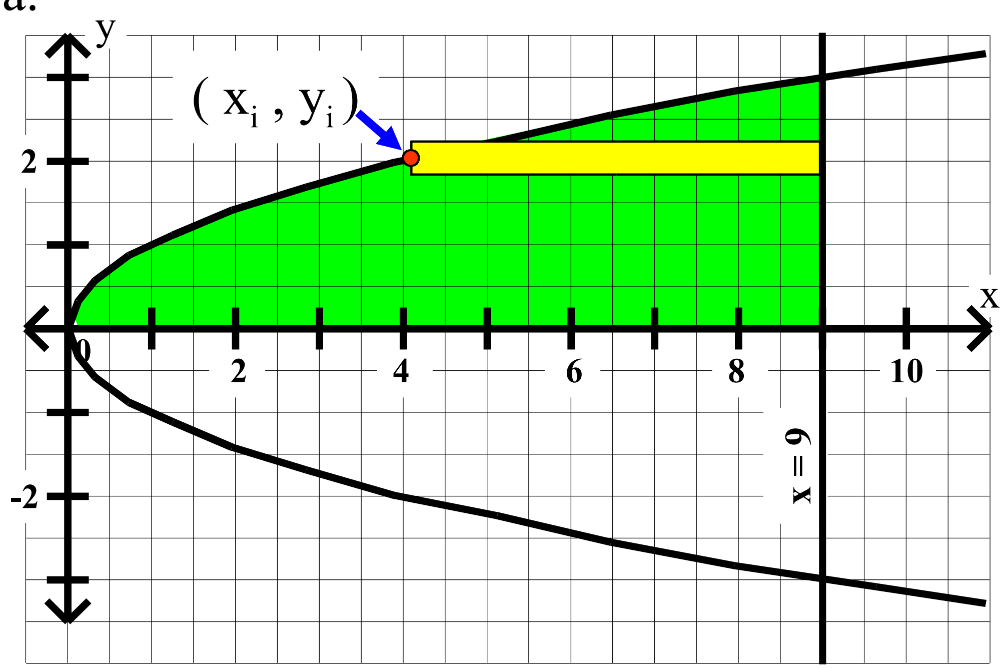

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \, \Delta y$

c. $V = \pi \int (9 - y^2)^2 \, dy$

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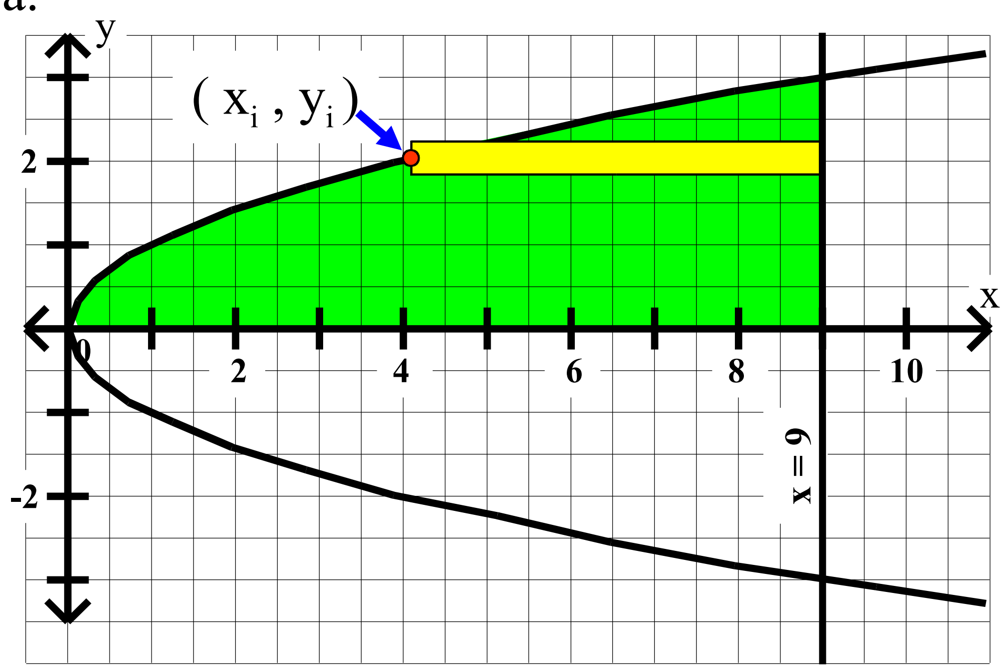

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \, \Delta y$

c. $V = \pi \int_0 (9 - y^2)^2 \, dy$

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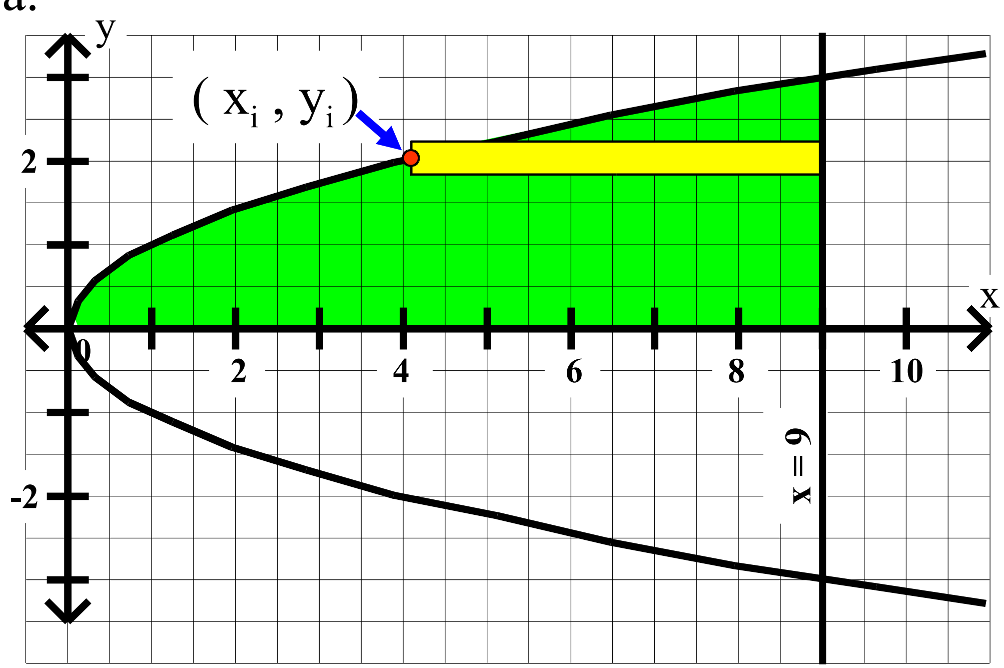

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V = \pi\int_0^3 (9 - y^2)^2\, dy$

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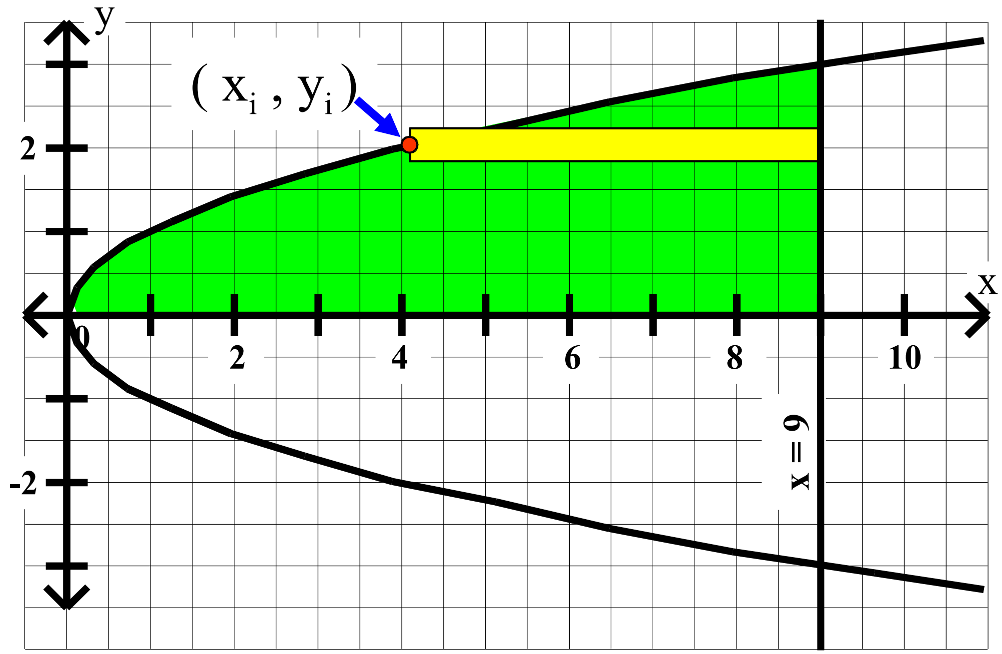

Disks: $V = \pi r^2 h$

$r = 9 - x_i = 9 - y_i^2$

$h = \Delta y$

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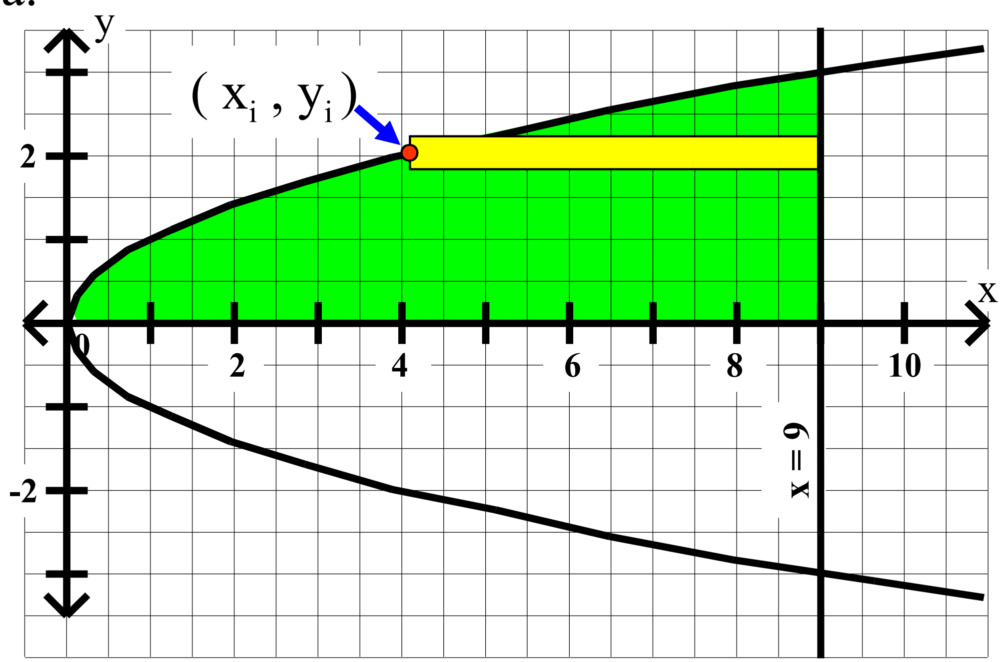

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$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V = \pi\int_0^3 (9 - y^2)^2 \, dy$

d. $V \approx$

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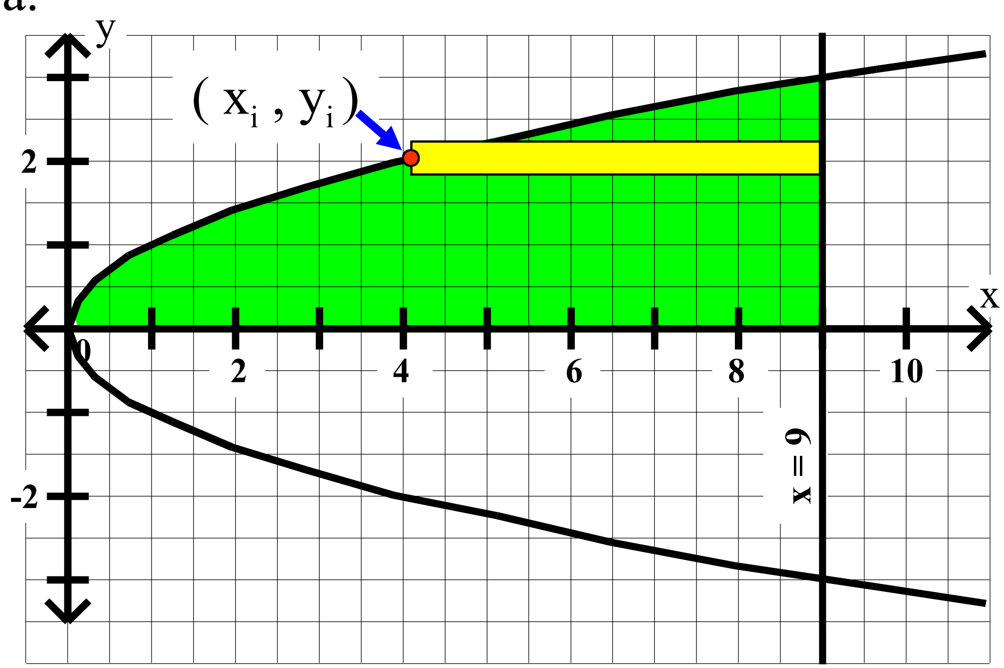

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$h = \Delta y$

b. $V_i = \pi(9 - y_i^2)^2 \, \Delta y$

c. $V = \pi \int_0^3 (9 - y^2)^2 \, dy$

d. $V \approx 407$ cu. units

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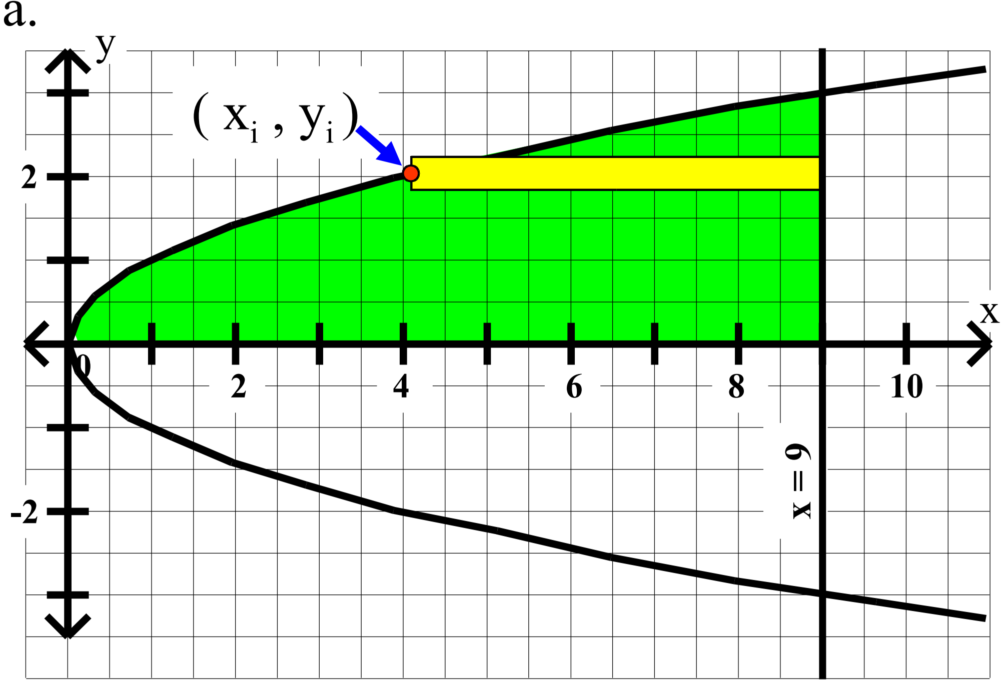

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b. $V_i = \pi(9 - y_i^2)^2 \Delta y$

c. $V = \pi\int_0^3 (9 - y^2)^2 \, dy$

d. $V \approx 407$ cu. units