A rectangular plate is formed from the region in the first quadrant below the line $y = 24$ and to the left of the line $x = 36$, where $x$ and $y$ are measured in cm as shown.

The density of the plate is 0.7 g/cm$^2$. What is its mass?
2. **Question Details**

The rectangular plate from Problem 1 is sliced into thin vertical slices of width $dx$ as shown.

![Diagram of a rectangular plate sliced vertically]

The density of the plate is $0.7 \text{ g/cm}^2$. Write a formula for the mass of this slice. Do not include units.

3. **Question Details**

The rectangular plate from Problem 1 is sliced into thin horizontal slices of height $dy$ as shown.

![Diagram of a rectangular plate sliced horizontally]

The density of the plate is $0.7 \text{ g/cm}^2$. Write a formula for the mass of this slice. Do not include units.
A rectangular cutting board is built from strips of different types of wood, each 4 cm wide, as shown in the figure below.

Find the mass of the cutting board, accurate to two decimal places, assuming:

- The density of oak is 0.74 g/cm².
- The density of walnut is 0.57 g/cm².
- The density of cherry is 0.63 g/cm².

mass = [ ]
A rectangular block is formed from the region in the first quadrant, below the line $y = 8$ and to the left of the line $x = 15$, where $x$ and $y$ are measured in cm as shown in the figure below.

This block has variable density given by the function $\rho(x) = 0.06x(15 - x)$ g/cm$^2$

a. What is the mass, $dm$, of a thin vertical slice of width $dx$ located at $x$? Write the formula for the mass, do not include units.

$$dm = \rho(x) \, dx = 0.06x(15 - x) \, dx$$

b. What is the total mass of this board? Be accurate to one decimal digit and include units.

$$\text{mass} = \int_0^{15} \rho(x) \, dx = \int_0^{15} 0.06x(15 - x) \, dx$$
A rectangular block is formed from the region in the first quadrant, below the line $y = 8$ and to the left of the line $x = 15$ where $x$ and $y$ are measured in cm as shown in the figure below.

This block has variable density given by the function

$$\rho(y) = 3.5\sin\left(\frac{\pi}{8} y \right) \text{g/cm}^2$$

a. What is the mass, $dm$, of a thin horizontal slice of height $dy$ located at $y$? Write the formula for the mass, do not include units.

$$dm = \rho(y) dy = \rho(y) \left(\frac{\pi}{8} \right)$$

b. What is the total mass of this board? Be accurate to one decimal digit and include units.

$$\text{mass} = \int_0^8 \rho(y) dy = \int_0^8 \left(3.5\sin\left(\frac{\pi}{8} y \right) \text{g/cm}^2\right) dy$$
The region has variable density, \( \rho(x) = 4 - x \), as suggested by the shading from left to right.

True or False? Density is constant on the pictured slice.

○ True
○ False
The region has variable density, $\rho(x) = 4 - x$, as suggested by the shading from left to right.

True or False? Density is constant on the pictured slice.

- False
- True
The region has variable density, $\rho(y) = 4 - y$, as suggested by the shading from bottom to top.

True or False? Density is constant on the pictured slice.

- False
- True
The region has variable density, $\rho(y) = 4 - y$, as suggested by the shading from bottom to top.

True or False? Density is constant on the pictured slice.

- True
- False
Consider the region bounded by $y = \ln(x)$, $x = e$, and the x-axis, as shown below.

Assume this region has variable density

$$\rho = 4 - y^2$$

True or False? Density is constant on the pictured slice.

- False
- True
Consider the region bounded by $y = \ln(x)$, $x = e$, and the x-axis, as shown below.

Assume this region has variable density

$$\rho = 4 - y^2$$

True or False? Density is constant on the pictured slice.

- [ ] True
- [ ] False
Consider the region bounded by $y = \ln(x)$, $x = e$, and the x-axis, as shown below.

Assume this region has variable density

$$\rho = x + 1$$

True or False? Density is constant on the pictured slice.

- [ ] True
- [ ] False
Consider the region bounded by $y = \ln(x)$, $x = e$, and the x-axis, as shown below.

Assume this region has variable density

$$\rho = x + 1$$

True or False? Density is constant on the pictured slice.

- False
- True
Download and print this Worksheet #2. If you are unable to print the worksheet, recreate the region carefully on your own graph paper. Answer all worksheet questions. You may, as you complete each worksheet question, want to enter the answer below to get feedback.

Which axis did you choose?
- x-axis
- y-axis

What was the area of your slice?
\[ dA = \]

What was the mass of your slice?
\[ dm = \]

What was total mass? Be accurate to one decimal place and include units.
\[ \text{mass} = \]

---

A thin plate is in the shape of the region bounded by \( y = 2 - 2x^2 \), \( y = 3x \) and y-axis, where \( x \) and \( y \) are measured in feet. This plate has variable density \( \rho(x) = 3x(1-2x) \) pounds per square foot. The graph of the region and a typical slice are shown below.

Answer the following questions. Assume the typical slice is located at the position \( x \).

a. What does \( 2 - 2x^2 \) measure?
b. What does $3x$ measure?
   - The height of a typical slice.
   - The width of a typical slice.
   - The distance from the $x$-axis to the bottom of the typical slice.
   - The distance from the $x$-axis to the top of the typical slice.
   - The area of a typical slice.
   - The density of a typical slice.
   - The weight of a typical slice.

c. What does $2 - 2x^2 - 3x$ measure?
   - The height of a typical slice.
   - The width of a typical slice.
   - The distance from the $x$-axis to the bottom of the typical slice.
   - The distance from the $x$-axis to the top of the typical slice.
   - The area of a typical slice.
   - The density of a typical slice.
   - The weight of a typical slice.

d. What does $dx$ measure?
   - The height of a typical slice.
   - The width of a typical slice.
   - The distance from the $x$-axis to the bottom of the typical slice.
   - The distance from the $x$-axis to the top of the typical slice.
   - The area of a typical slice.
   - The density of a typical slice.
   - The weight of a typical slice.

e. What does $3x(1 - 2x)$ measure?
f. What does $(2 - 2x^2 - 3x)dx$ measure?
   - The height of a typical slice.
   - The width of a typical slice.
   - The distance from the $x$-axis to the bottom of the typical slice.
   - The distance from the $x$-axis to the top of the typical slice.
   - The area of a typical slice.
   - The density of a typical slice.
   - The weight of a typical slice.

g. What does $3x(1 - 2x)(2 - 2x^2 - 3x)dx$ measure?
   - The height of a typical slice.
   - The width of a typical slice.
   - The distance from the $x$-axis to the bottom of the typical slice.
   - The distance from the $x$-axis to the top of the typical slice.
   - The area of a typical slice.
   - The density of a typical slice.
   - The weight of a typical slice.
A flat plate is formed in the shape of the region bounded by $y = 2 - 0.5x^2$ and the $x$-axis, as shown in the figure below. Both axes are measured in meters.

The plate has variable density

$$\rho(x) = 5.4 - 0.2x^2 \text{ kg/m}^2$$

a. Choose an appropriate slicing strategy. What axis should you integrate along?

- $x$-axis
- $y$-axis

b. Write a formula for the mass of one slice in your slicing strategy. Do not include units.

$$dm =$$

c. What is the mass of the plate? Be accurate to two decimal digits and include correct units.

$$\text{mass} =$$
A tapered piece of thin steel is shaped as shown below. Both axes are measured in cm.

The density of the steel is variable:

\[ \rho(y) = 1.4 - 0.1y \text{ g/cm}^2 \]

a. Choose an appropriate slicing strategy. What axis should you integrate along?

- x-axis
- y-axis

b. Write a formula for the mass of one slice in your slicing strategy. Do not include units.

\[ dm = \]

c. What is the mass of the piece of steel? Be accurate to two decimal digits and include correct units.

\[ \text{mass} = \]
A flat plate is formed in the shape of the region bounded by $y = 2 - 0.5x^2$ and the $x$-axis, as shown in the figure below. Both axes are measured in meters.

The plate has variable density

$$\rho(y) = 3.6 - 0.5y \text{ kg/m}^2$$

a. Choose an appropriate slicing strategy and then write a formula for the mass of one slice. Do not include units.

$$dm =$$

b. What is the mass of the plate? Be accurate to two decimal digits and include correct units.

$$\text{mass} =$$
A triangular plate is formed from the region in the first quadrant, below the line $y = 4 - x$ and above the line $y = \frac{1}{3}x$ where $x$ and $y$ are measured in meters as shown in the figure below.

The plate has variable density given by the function

$$\rho(y) = 6y(4 - y) \text{ kg/m}^2$$

What is the mass of the plate?

mass =