# Connecting what we know about Area

**Link 1: Different ways to find Area**

## Equation

Given the function:

$$f(x) = \sqrt{4 - x^2}$$

Draw a graph in a [-3,3] by [-1,3] window below.

Do you recognize the shape? If so, what can you say about it?

## Geometric

**Using what you know about this shape and geometry, find the area between the shape and the x-axis. Show all work.**

## Riemann Sum

**a. Partition this shape into 4 MRAM subintervals, compute the area between the shape and the x-axis without a calculator.**

**b. Using a calculator program calculate the following:**

| n | LRAM | MRAM | RRAM |
|---|---|---|---|
| 4 | | | |
| 10 | | | |
| 50 | | | |

**c. Make a conjecture about the area of the shape.**

## Definite Integral

**a. Express the area as an integral.**

**b. Express in calculator notation what you would use to solve this integral.**

**c. Solve this integral using the calculator**

**d. Based on all of your answers, what can you surmise about the different ways to calculate area?**

# Connecting what we know about Area

**Link 2: Discontinuous functions and Area**

| Equation | Geometric |
|---|---|
| Given the function:<br><br>$f(x) = \frac{\lvert x \rvert}{x}$<br><br>Draw a graph in a [-1,2] by [-2,2] window below. | **Using what you know about this shape and geometry, find the area between the shape and the x-axis. Show all work.** |
| **Definite Integral** | **Analysis** |
| **a. Express the area between the shape and the x-axis using an integral(s).**<br><br>**b. Express in calculator notation what you would use to solve this integral.**<br><br>**c. Evaluate this integral using the calculator** | **a. Does your geometric answer match your answer calculated by the graphing calculator?**<br><br>**b. Does a different answer other than the one you calculated make more sense?**<br><br>**c. Make a conjecture about the area of this discontinuous shape.** |

# Connecting what we know about Area

**Link 3: Discontinuous functions and Area**

| Equation | Geometric |
|---|---|
| Given the function:<br>$$f(x) = \frac{x^2 - 4}{x - 2}$$<br>Draw a graph in a [0,3] by [0,6] window below.<br><br>**Do you recognize the shapes? If so, what observations can you make about it?** | **Using what you know about this shape and geometry, find the area between the shape and the x-axis. Show all work.** |
| **Definite Integral** | **Analysis** |
| **a. Express the area as an integral.**<br><br>**b. Express in calculator notation what you would use to solve this integral.**<br><br>**c. Solve this integral using the calculator** | **a. Does this graph have a discontinuity? If so, what kind of discontinuity?**<br><br>**b. Does the discontinuity affect the area?**<br><br>**c. Make a conjecture about the area of this discontinuous shape.** |

# Connecting what we know about Area

**Extension:**

1. **Use Areas to show that $\int_0^5 \text{int}(x)dx = 10$ and confirm your answer with the calculator.**

2. **Use Areas to show that $\int_{-4}^6 \text{int}(2x)dx = 47$ and confirm your answer with the calculator.**