Finding areas the hard way

The area under (and the x-axis) for



Area?

Rectangle + triangle

The area under the parabola for



Area? (The easy way)

Area?(The hard way)

The general hard way is to approximate the region by a lot of thin rectangles and take the limit as they get infinitely thin...

Using the “Right-hand Rule”:

Split [3, 7] into n equal pieces – each will have width

1st rectangle’s area = base x height =

2nd rectangle’s area = base x height =

3rd rectangle’s area = base x height =

.

.

.

kth rectangle’s are = base x height =

The sum of the areas of the rectangles

So the area is actually the

Solution:

In real life we use The Fundamental Theorem of Calculus

1. Area under for where F(x) is any anti-derivative of f(x) is

Example: for

“The” anti-derivative of x is .

The area below the x-axis is “negative area”.

The Fundamental Theorem of Calculus (version 1.0)

 whenever

The Fundamental Theorem of Calculus (version 2.0)

If

Then

Order properties of the definite integral:

1. If on

Then

1. Suppose

For x in . Then

Why? Because

So

Ex:

What can we find out about?

We can’t easily evaluate this, but we can estimate it:

Because

|  |  |
| --- | --- |
|      |  |