Estimating Area **Name**_____

Go to this website: http://mathworld.wolfram.com/RiemannSum.html

I. Graph $f(x) = x^2 + 1$ (enter as f(x) = x^2+1) on the interval [0, 4] with 4 rectangles. Choose "Left" rectangles.

a. Look at the graph. Will this be an under or over-estimate? Explain how you know.

b. Fill in the table with the estimated area for each number of rectangles.

Number of Rectangles	Estimated area
4	
40	
100	

c. What is the actual area? $\int_0^4 (x^2+1)dx =$ _____

d. Are the estimations under or over the actual value? Does this match your answer from part a?

e. Calculate the percent error for each of the estimations

Number of rectangles	Percent error
4	
40	
100	

f. How can the percent error be decreased? Explain.

g. How many rectangles would you need to calculate the actual area? Explain.

II. Graph $f(x) = x^2 + 1$ (enter as f(x) = x^2+1) on the interval [0, 4] with 4 rectangles. Choose "Right" rectangles.

a. Look at the graph. Will this be an under or over-estimate? Explain how you know.

b. Fill in the table with the estimated area for each number of rectangles.

Number of Rectangles	Estimated area
4	
40	
100	

c. What is the actual area? $\int_0^4 (x^2 + 1)dx =$ _____

d. Are these estimations under or over the actual value? Does this match your answer from part a?

e. Calculate the percent error for each estimation.

Number of rectangles	Percent error
4	
40	
100	

f. How can the percent error be decreased? Explain.

g. How many rectangles would you need to calculate the actual area? Explain.

III . Graph $f(x) = x^2 + 1$ (enter as f(x) = x^2+1) on the interval [0, 4] with 4 rectangles. Choose "Midpoint" rectangles.

a. Look at the graph. Will this be an under or over-estimate? Explain how you know.

b. Fill in the table with the estimated area for each number of rectangles.

Number of Rectangles	Estimated area
4	
40	
100	

c. What is the actual area? $\int_0^4 (x^2+1)dx =$ _____

d. Are the estimations under or over the actual value? Does this match your answer from part a?

e. Calculate the percent error for each estimation.

Number of rectangles	Percent error
4	
40	
100	

f. How can the percent error be decreased? Explain.

g. How many rectangles would you need to calculate the actual area? Explain.

IV. Answer the following questions. Circle the word that best completes the sentences.

a. For functions that are always increasing, the *left/right* sum estimation will be an *under/over* estimation.

b. For functions that are always decreasing, the *left/right* estimation will be an *under/over* estimation.

c. The *left/right/midpoint* has the smallest percent error.

i. Explain your answer from part c geometrically

ii. Explain your answer from part c numerically