

- 1) Consider the diagram above, in which rectangular approximation is being used to estimate the area between a function  $f(x)$  and the  $x$ -axis.
  - a) Which approximation method is being used? **LRAM**    **MRAM**    **RRAM**    (*circle one*)
  - b) How many subintervals are being used? \_\_\_\_\_
  - c) What is the width of each subinterval? \_\_\_\_\_
  - d) Will the approximate be an underestimate or an overestimate? \_\_\_\_\_
  - e) On what interval is the approximation being made? \_\_\_\_\_
  
- 2) Paulus is using LRAM to approximate the area between the curve  $y = x^3 + x + 7$  and the  $x$ -axis on the interval  $[1, 5]$ .
  - a) If Paulus wishes to use 100 subintervals, what will be the width of each subinterval?
  
  - b) What will be the area of the third rectangle?
  
  - c) Would the area of the third rectangle be the same if Paulus was using RRAM or MRAM instead of LRAM? Explain.
  
  - d) Use a calculator program to determine Paulus' approximation (using LRAM).

3) Carmelita is using rectangular approximation to determine the area between a function  $f(x)$  and the x-axis on the interval  $[0, 2]$ . To do so, she made the following calculation.

$$A \approx \frac{1}{4} \left(\frac{1}{4}\right)^5 \ln\left(\frac{1}{4}\right) + \frac{1}{4} \left(\frac{1}{2}\right)^5 \ln\left(\frac{1}{2}\right) + \frac{1}{4} \left(\frac{3}{4}\right)^5 \ln\left(\frac{3}{4}\right) + \frac{1}{4} (1)^5 \ln(1) + \frac{1}{4} \left(\frac{5}{4}\right)^5 \ln\left(\frac{5}{4}\right) + \frac{1}{4} \left(\frac{3}{2}\right)^5 \ln\left(\frac{3}{2}\right) + \frac{1}{4} \left(\frac{7}{4}\right)^5 \ln\left(\frac{7}{4}\right) + \frac{1}{4} (2)^5 \ln(2)$$

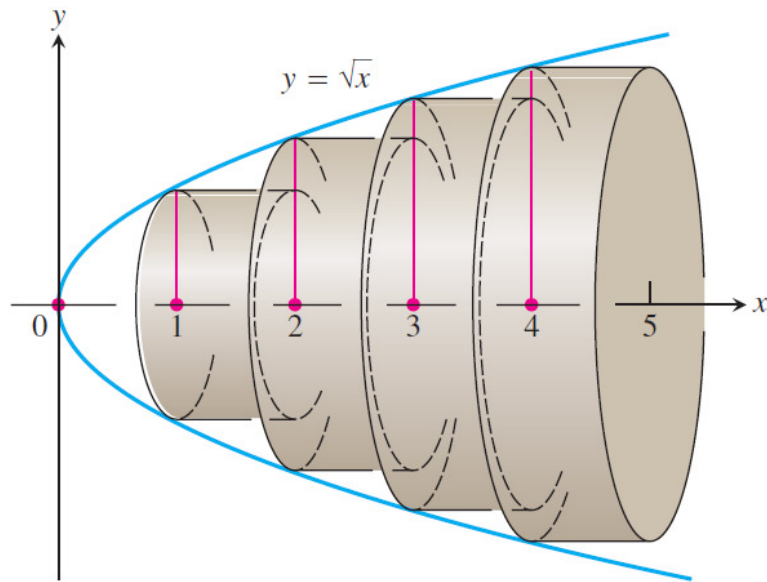
- How many subintervals did Carmelita use? \_\_\_\_\_
- What is the width of each subinterval? \_\_\_\_\_
- Is Carmelita using LRAM, MRAM or RRAM? \_\_\_\_\_
- What is the equation of the function  $f(x)$ ? \_\_\_\_\_

4) Consider the data in the following table.

Time (sec)	Velocity (in./sec)	Time (sec)	Velocity (in./sec)
0	0	6	11
1	12	7	6
2	22	8	2
3	10	9	6
4	5	10	0
5	13		

- Write an expression for using LRAM with 4 subintervals to estimate the distance travelled on the interval  $[2, 6]$ .
- Write an expression for using RRAM with 4 subintervals to estimate the distance travelled on the interval  $[2, 6]$ .
- Can we write an expression for using MRAM with 4 subintervals to estimate the distance travelled on the interval  $[2, 6]$ ? Explain.

- 5) A paraboloid is created by revolving the curve  $y = \sqrt{x}$  about the  $x$ -axis on the interval  $[0, 5]$ , as shown below.



- a) Estimate the volume of the paraboloid using LRAM with 5 cylinders of equal height.
- b) If 50 cylinders of equal height are used to approximate the volume, what would be the height of each cylinder?
- c) With a calculator program, estimate the volume of the paraboloid using RRAM with 50 cylinders of equal height.