

# AP CALCULUS AB

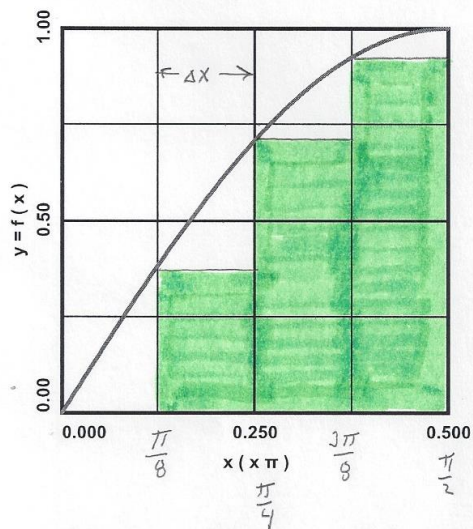
Estimate the area under  $f(x) = \sin x$  on  $x \in [0, \pi/2]$  using four equal subdivisions with

a) LRAM    b) MRAM    c) RRAM

Draw the rectangles used on the grids provided. Also, answer the questions:

- Which method underestimates the area? LRAM
- Which method overestimates the area? RRAM

a) LRAM



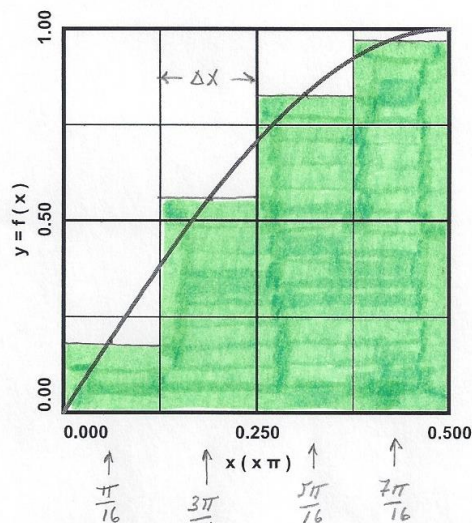
$$\Delta x = \frac{\pi}{8} = \text{subdivision size}$$

$$\text{area} \approx \left[ f(0) + f\left(\frac{\pi}{8}\right) + f\left(\frac{\pi}{4}\right) + f\left(\frac{3\pi}{8}\right) \right] \Delta x =$$

$$= 0.7907662601$$

# ESTIMATING AREAS UNDER CURVES

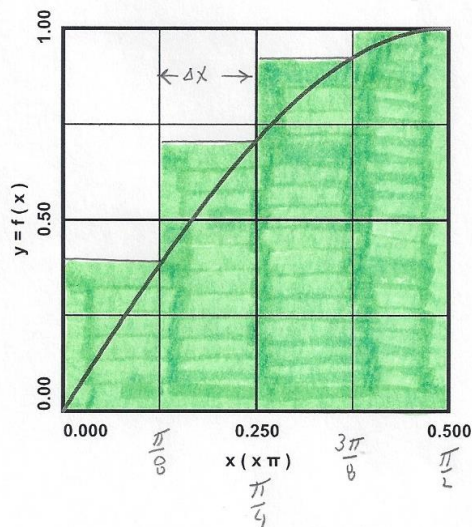
b) MRAM



$$\text{area} \approx \left[ f\left(\frac{\pi}{16}\right) + f\left(\frac{3\pi}{16}\right) + f\left(\frac{5\pi}{16}\right) + f\left(\frac{7\pi}{16}\right) \right] \Delta x =$$

$$= 1.006454543$$

c) RRAM



$$\text{area} \approx \left[ f\left(\frac{\pi}{8}\right) + f\left(\frac{\pi}{4}\right) + f\left(\frac{3\pi}{8}\right) + f\left(\frac{\pi}{2}\right) \right] \Delta x =$$

$$= 1.183465342$$