Section 4.2 & 4.6 Day3

Do now:

① MRAM $A = 2f(-1) + 2f(1) + 2f(3)$

$= 2\left(\frac{e^{-1}}{2} + \frac{e}{2} + \frac{e^3}{2}\right) = \frac{1}{e} + e + e^3$

Trapezoid $A = \frac{1}{2}(2)\left(f(-2) + 2f(0) + 2f(2) + f(4)\right)$

$= \frac{e^{-2}}{2} + \frac{2e^0}{2} + \frac{2e^2}{2} + \frac{e^4}{2} = \frac{1}{2e^2} + 1 + e^2 + \frac{e^4}{2}$

② The area represents the total number of sales in millions of units over 10 years

$\text{sales (time)} = \frac{\text{millions of units}}{\text{years}}\left(\text{years}\right) = \text{millions of units}$

Notes

a) $\sum_{k=1}^{4} f(k) = \sum_{k=1}^{4} k^2+3 = (1^2+3)+(2^2+3)+(3^2+3)+(4^2+3) = 4+7+12+19 = 42$

b) unequal subintervals, utilize LRAM, RRAM & MRAM in the same example, number of rectangles are increasing, approximate area under a curve

$\Delta x = \frac{b-a}{n}$ LRAM $A \approx \Delta x \sum_{i=0}^{n-1} f(a+\Delta x i)$

RRAM $A = \Delta x \sum_{i=1}^{n} f(a+\Delta x i)$

MRAM $A \approx \Delta x \sum_{i=0}^{n-1} f\left(a + \underbrace{\frac{\Delta x}{2}(2i+1)}_{\Delta x i + \frac{\Delta x}{2}}\right)$

Class Work:

① Amount of water that leaked out of the container over 5.4 minutes

$\frac{\text{liters}}{\text{min}}(\text{min}) = \text{liters}$

RRAM $A = 1.2(4.3) + 1.1(3.1) + 1.5(2.2) + 1.6(1.5) = 14.27$ liters

② Distance the car traveled over a 10 second interval

$\frac{\text{in}}{\text{sec}}(\text{sec}) = \text{in}$

LRAM $D = 1(v(0) + v(1) + v(2) + v(3) + v(4) + v(5) + v(6) + v(7) + v(8) + v(9))$
$= 1(0 + 6 + 10 + 16 + 14 + 12 + 18 + 22 + 12 + 4 + 2) = 114$ in

RRAM $D = 1(v(1) + v(2) + v(3) + v(4) + v(5) + v(6) + v(7) + v(8) + v(9) + v(10))$
$= 1(6 + 10 + 16 + 14 + 12 + 18 + 22 + 12 + 4 + 2) = 116$ in

MRAM $D = 2(v(1) + v(3) + v(5) + v(7) + v(9))$
$= 2(6 + 16 + 12 + 22 + 4) = 120$ in

③ LRAM $T = 5(24 + 76 + 106 + 124 + 135) = 2,325°C$

Avg Temp: $\frac{2,325}{25} = 93°$

④ $D = 10(v(5) + v(15) + v(25) + v(35)) = 10(9.2 + 7 + 2.4 + 4.3) = 229$ miles
↑ MRAM

LRAM $D = 5(v(0) + v(5) + v(10) + v(15) + v(20) + v(25) + v(30) + v(35))$
$= 231.5$ miles

RRAM $D = 5(v(5) + v(10) + \ldots + v(40)) = 233$ miles

⑤ Amount of pollutants that escape

$P = \frac{1}{2}(1)(5+7) + \frac{1}{2}(2)(7+8) + \frac{1}{2}(1)(8+10) + \frac{1}{2}(2)(10+13) + \frac{1}{2}(1)(13+16) + \frac{1}{2}(2)(16+20)$

6. LRAM $D = 1(0+12+22+10+5+13+11+6+2+6 = 87$ in

* RRAM $D = 3(10)+4(6)+3(0) = 54$ in

MRAM $D = 2(12+10+13+6+6) = 94$ in

* Trap $D = \frac{1}{2}(2(0+22)+3(22+13)+2(13+6)+3(6+0)) = 102.5$ in

* Answers will vary due to unequal intervals*

7. $\Delta x = \frac{\pi-0}{3} = \frac{\pi}{3}$

LRAM $A = \frac{\pi}{3}\left(f(0)+f(\pi/3)+f(2\pi/3)\right) = \frac{\pi}{3}\left(0+\frac{\pi}{3}+\frac{\sqrt{3}}{2}+\frac{2\pi}{3}+\frac{\sqrt{3}}{2}\right)$

$= \frac{\pi}{3}\left(\pi+\sqrt{3}\right) \approx 5.104$

RRAM $A = \frac{\pi}{3}\left(f(\pi/3)+f(2\pi/3)+f(\pi)\right) = \frac{\pi}{3}\left(\frac{\pi}{3}+\frac{\sqrt{3}}{2}+\frac{2\pi}{3}+\frac{\sqrt{3}}{2}+\pi\right)$

$= \frac{\pi}{3}\left(2\pi+\sqrt{3}\right) \approx 8.394$

MRAM $A = \frac{\pi}{3}\left(f(\pi/6)+f(\pi/2)+f(5\pi/6)\right) = \frac{\pi}{3}\left(\frac{\pi}{6}+\frac{1}{2}+\frac{\pi}{2}+1+\frac{5\pi}{6}+\frac{1}{2}\right)$

$= \frac{\pi}{3}\left(\frac{3\pi}{2}+2\right) \approx 7.029$

Trap $A = \frac{1}{2}\left(\frac{\pi}{3}\right)\left(f(0)+2f\left(\frac{\pi}{3}\right)+2f\left(\frac{2\pi}{3}\right)+f(\pi)\right)$

$= \frac{\pi}{6}\left(0+2\left(\frac{\pi}{3}+\frac{\sqrt{3}}{2}\right)+2\left(\frac{2\pi}{3}+\frac{\sqrt{3}}{2}\right)+\pi\right)$

$= \frac{\pi}{6}\left(3\pi+2\sqrt{3}\right) \approx 6.749$