# CHAD - ch. 5A review

③ (cont.)

$TRAP_5 = \frac{1}{2}(1)\left[5+2(3)+2(1)+2(2)+2(5)+10\right]$ (h = 1)

$= \frac{1}{2}\left[5+4+2+4+10+10\right]$

$= \frac{1}{2}(35) = \boxed{\frac{35}{2}}$ (C)

④ $\sum_{k=1}^{n} 8k^2 = 8\sum_{k=1}^{n} k^2 = 8\,\frac{n(n+1)(2n+1)}{6}$

$= \frac{4}{3}n(n+1)(2n+1) = \frac{4}{3}n(2n^2+n+2n+1)$

$= \frac{4}{3}n(2n^2+3n+1) = \boxed{\frac{8}{3}n^3+4n^2+\frac{4}{3}n}$ (B)

⑤ $\sum_{k=1}^{n} 2k^2+3 = \sum_{k=1}^{n} 2k^2 + \sum_{k=1}^{n} 3 = 2\sum_{k=1}^{n} k^2 + \sum_{k=1}^{n} 3$

$= 2\,\frac{(n)(n+1)(2n+1)}{6} + 3n = \frac{1}{3}n(n+1)(2n+1) + 3n$

$= \frac{1}{3}n(2n^2+3n+1) + 3n = \frac{2}{3}n^3+n^2+\frac{1}{3}n+3n$

$= \boxed{\frac{2}{3}n^3+n^2+\frac{10}{3}n}$ (C)

NOTE: $3n = \frac{9}{3}n$

⑥ LRAM from table (width of boxes varies)

| x | 0 | 5 | 6 | 7 | 9 |
|---|---|---|---|---|---|
| y | 6 | 5 | 3 | 5 | 4 |

$= 5(6)+5+3+2(5)$

$= 30+5+3+10$

$= \boxed{48}$ (B)

$LRAM = (5-0)\,6 + (6-5)\cdot 5 + (7-6)\cdot 3 + (9-7)(5)$

width · left height: $w \cdot H_L \quad w \cdot H_L \quad w \cdot H_L$

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(7) RRAM from table

* NOTE: WIDTH of BOXES VARIES!!

| x | 0 | 5 | 7 | 9 | 10 |
|---|---|---|---|---|---|
| y | 8 | 6 | 8 | 7 | 6 |

$RRAM = \underset{w \cdot hr}{(5-0)\cdot 6} + \underset{w \cdot hr}{(7-5)\cdot 8} + \underset{w \cdot hr}{(9-7)\cdot 7} + \underset{w \cdot hr}{(10-9)\cdot 6}$

$= 5(6) + 2(8) + 2(7) + 1(6)$

$= 30 + 16 + 14 + 6 = \boxed{66}$ (D)

(8) $\int_0^4 -2x+2\,dx = \left[-x^2+2x\right]_0^4$

$= (-16+8) - (0+0) = \boxed{-8}$ (D)

(9) $\int_{-7}^{-3} (x+2)\,dx = \left[\frac{x^2}{2}+2x\right]_{-7}^{-3}$

$\left(\frac{9}{2}-6\right) - \left(\frac{49}{2}-14\right) = \frac{9}{2}-6+\frac{49}{2}+14$

$= \frac{9}{2}-\frac{49}{2}-6+14 = -\frac{40}{2}+8 = -20+8 = \boxed{-12}$

(B)

(10) $\int_{-4}^{-2} \frac{4}{x}\,dx = \left[4\ln|x|\right]_{-4}^{-2}$

$= \boxed{4\ln 2 - 4\ln 4}$ (B)

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(11) $\int_{-1}^{2} -5x^{1/3}\,dx = \left[\frac{-5x^{4/3}}{4/3}\right]_{-1}^{2}$

$= \left[\frac{-15}{4}x^{4/3}\right]_{-1}^{2} = \frac{-15}{4}(2)^{4/3} - \frac{-15}{4}(-1)^{4/3}$

$= \frac{-15}{4}2^1\cdot 2^{1/3} + \frac{15}{4} = \frac{-30\cdot 2^{1/3}}{4} + \frac{15}{4}$

$= \boxed{\frac{-30\sqrt[3]{2}+15}{4}}$ (B)

(12) $\int 4\,dx = \boxed{4x+C}$ (C)

(13) $\int \frac{-5x^2-4}{x^2} = \int \frac{-5x^2}{x^2} - \frac{4}{x^2}\,dx$

$= \int -5 - 4x^{-2}\,dx = -5x - \frac{4x^{-1}}{-1} + C$

$= \boxed{-5x + \frac{4}{x} + C}$ (B)

(14) $\int \frac{6(-5x^{10}+2)}{x^5}\,dx = \int \frac{-30x^{10}+12}{x^5}\,dx$

$= \int \frac{-30x^{10}}{x^5} + \frac{12}{x^5}\,dx = \int -30x^5 + 12x^{-5}\,dx$

$= \frac{-30x^6}{6} + \frac{12x^{-4}}{-4} + C$ (C)

$= \boxed{-5x^6 - \frac{3}{x^4} + C}$

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(15) $\int x^2(-20x^2-12x-9)\,dx$

$= \int -20x^4-12x^3-9x^2\,dx$

$= -\frac{20x^5}{5} - \frac{12x^4}{4} - \frac{9x^3}{3} + C$

$= \boxed{-4x^5-3x^4-3x^3+C}$ (C)

(16) $\int \frac{-32x^3x^{3/5}+75x^3x^{1/4}-200}{20x^3}\,dx$

$= \int -\frac{32x^3x^{3/5}}{20x^3} + \frac{75x^3x^{1/4}}{20x^3} - \frac{200}{20x^3}\,dx$

$= \int -\frac{8}{5}x^{3/5} + \frac{15}{4}x^{1/4} - 10x^{-3}\,dx$

$= \frac{5}{8}\left(-\frac{8}{5}\right)x^{8/5} + \frac{4}{5}\left(\frac{15}{4}\right)x^{5/4} - \frac{10x^{-2}}{-2} + C$

$= \boxed{-x^{8/5}+3x^{5/4}+\frac{5}{x^2}+C}$ (C)

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(17) $\int -3\csc^2 x\,dx = -3\int \csc^2 x\,dx$

$= -3[-\cot x] + C = \boxed{3\cot x + C}$

(C)

(18) $\int -2\sec^2 x\,dx = -2\int \sec^2 x\,dx$

$= -2[+\tan x] + C = \boxed{-2\tan x + C}$

(B)

(19) $\int -4\sin x\,dx = -4\int \sin x\,dx$ (B)

$= -4[-\cos x] + C = \boxed{4\cos x + C}$

(20) $\int e^x dx = \boxed{e^x + C}$ (A)

FR

(A) $y = x^2 + 4$ $[-2, 6]$ $RRAM_8$

$\Delta x = \frac{6-(-2)}{8} = \frac{8}{8} = 1$ ← intervals all have equal width $\frac{b-A}{n}$

| X | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Y | 8 | 5 | 4 | 5 | 8 | 13 | 20 | 29 | 40 |
| | 4+4 | 1+4 | 0+4 | 1+4 | 4+4 | 9+4 | 16+4 | 25+4 | 36+4 |

$RRAM_8 = 1(5 + 4 + 5 + 8 + 13 + 20 + 29 + 40)$ ← all endpts (y-vals) so exclude rightmost

$= 4 + 8 + 13 + 29 + 70 = 25 + 29 + 70$ leftmost

$= 54 + 70 = \boxed{124}$

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$y = x^2 + 4$ $[-2, 6]$

FR (B) $MRAM_8$ ... so table must include the MIDPOINTS ($x = -\frac{3}{2}, -1, -\frac{1}{2}, \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2}, \frac{11}{2}$) of the intervals.
width of each intervals is still $\frac{b-a}{n} = \frac{8}{8} = 1$

MRAM table

| x | -2 | mp -3/2 | -1 | mp -1/2 | 0 | mp 1/2 | 1 | mp 3/2 | 2 | mp 5/2 |
|---|---|---|---|---|---|---|---|---|---|---|
| y | | 25/4 | | 17/4 | | 17/4 | | 25/4 | | 41/4 |
| | | $\frac{9}{4}+\frac{16}{4}$ | | $\frac{1}{4}+\frac{16}{4}$ | | $\frac{1}{4}+\frac{16}{4}$ | | $\frac{9}{4}+\frac{16}{4}$ | | $\frac{25}{4}+\frac{16}{4}$ |

| x | 3 | mp 7/2 | 4 | mp 9/2 | 5 | mp 11/2 | 6 |
|---|---|---|---|---|---|---|---|
| y | | 65/4 | | 97/4 | | 137/4 | |
| | | $\frac{49}{4}+\frac{16}{4}$ | | $\frac{81}{4}+\frac{16}{4}$ | | $\frac{121}{4}+\frac{16}{4}$ | |

$MRAM_8 = 1\left(\frac{25}{4} + \frac{17}{4} + \frac{17}{4} + \frac{25}{4} + \frac{41}{4} + \frac{65}{4} + \frac{97}{4} + \frac{137}{4}\right)$

$= \frac{50}{4} + \frac{34}{4} + \frac{106}{4} + \frac{134}{4} = \frac{25}{2} + \frac{17}{2} + \frac{53}{2} + \frac{67}{2}$

$= \frac{42}{2} + \frac{120}{2} = 21 + 60 = \boxed{81}$

FR (C) TRAPEZOIDAL $n = 8$
(use original table)

$A \approx \frac{1}{2}\overset{n}{(1)}\left[8 + 2(5) + 2(4) + 2(5) + 2(8) + 2(13) + 2(20) + 2(29) + 40\right]$

$\approx \frac{1}{2}\left[8 + \underline{10} + 8 + \underline{10} + 16 + 26 + \underline{40} + 58 + \underline{40}\right]$

$\approx \frac{1}{2}\left[8 + 8 + 16 + 26 + 58 + 100\right] =$

$\approx \frac{1}{2}\left[\underline{32} + 26 + \underline{58} + 100\right] = \frac{1}{2}\left[90 + 26 + 100\right] = \frac{216}{2}$

$= \boxed{108}$

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FR-D) Simpson's method

$\frac{b-a}{n}$

$= \frac{1}{3}(1)\left[8+4(5)+2(4)+4(5)+2(8)+4(13)+2(20)+4(29)+40\right]$

$= \frac{1}{3}\left[8+20+8+20+16+52+40+116+40\right]$

$= \frac{1}{3}\left[8+8+16+52+116+120\right]$

$= \frac{1}{3}\left[32+52+116+120\right] = \frac{1}{3}\left[84+116+120\right]$

$= \frac{1}{3}\left[200+120\right] = \boxed{\frac{320}{3}}$

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① $y = -x^2 + 11$ $[-1, 3]$ $LRAM_4$

$\Delta x = \frac{3-(-1)}{4} = \frac{4}{4} = 1$

| x | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|
| y | 10 | 11 | 10 | 7 | 2 |
| | $-1+11$ | $0+11$ | $-1+11$ | $-4+11$ | $-9+11$ |

(B)

$LRAM_4 = 1(10) + 1(11) + 1(10) + 1(7)$

$= 10 + 11 + 10 + 7 = 20 + 18 = \boxed{38}$

② $y = x^2 - 2x + 2$ $[-2, 2]$ $RRAM_4$

$\Delta x = \frac{2-(-2)}{4} = \frac{4}{4} = 1$

| x | -2 | -1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| y | 10 | 5 | 2 | 1 | 2 |
| | $4+4+2$ | $1+2+2$ | $0+0+2$ | $1-2+2$ | $4-4+2$ |

$RRAM_4 = (1)(5) + (1)(2) + (1)(1) + 1(2)$

$= 5 + 2 + 1 + 2 = \boxed{10}$

(A)

③ $y = x^2 - 2x + 2$ $[-1, 4]$ $TRAP_5$

$\Delta x = \frac{4-(-1)}{5} = \frac{5}{5} = 1$

| x | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| y | 5 | 2 | 1 | 2 | 5 | 10 |
| | $1+2+2$ | $0+0+2$ | $1-2+2$ | $4-4+2$ | $9-6+2$ | $16-8+2$ |