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Section: M

Assignment 1

1. a) $\int_0^2 e^{-3x}\,dx$ $(n=4)$

Here, $a=0,\ b=2,\ n=4$

$$\Delta x = \frac{b-a}{n} = \frac{2-0}{4} = 0.5$$

RS $[x_{r-1}, x_r]$	Left		right		middle	
	C_r	$f(C_r)$	C_r	$f(C_r)$	C_r	$f(C_r)$
0, 0.5	0	1	0.5	0.2231	0.25	0.472
0.5, 1	0.5	0.2231	1	0.0498	0.75	0.105
1, 1.5	1	0.0498	1.5	0.0111	1.25	0.024
1.5, 2	1.5	0.0111	2	0.0025	1.75	0.005
$\Sigma f(C_r)$		1.284		0.2865		0.606
$\Delta x * \Sigma f(C_r)$		0.642		0.14325		0.303

Trapezoidal $\approx \frac{0.5}{2}[1+2(0.2231)+2(0.0498)+2(0.0111)+0.0025]$

$\int_0^2 e^{-3x}\,dx \approx$

≈ 0.3926

≈ 0.393

(Answer)

b) $\int_1^7 \frac{1}{\sqrt{x^3+1}}\,dx \quad (n=6)$

Here,

$a=1,\ b=7,\ n=6$

$\Delta x = \frac{b-a}{n}$

$= \frac{7-1}{6}$

$= 1$

RS $[x_{n-1}, x_n]$	Left		right		middle	
	C_n	$f(C_n)$	C_n	$f(C_n)$	C_n	$f(C_n)$
1, 2	1	0.7071	2	0.3333	1.5	0.478
2, 3	2	0.3333	3	0.1889	2.5	0.245
3, 4	3	0.1889	4	0.1240	3.5	0.151
4, 5	4	0.1240	5	0.0891	4.5	0.104
5, 6	5	0.0891	6	0.0678	5.5	0.77
6, 7	6	0.0678	7	0.0539	6.5	0.060
$\sum f(C_n)$		1.5102		0.857		1.808
$\Delta x * \sum f(C_n)$		1.5102		0.857		1.808

Trapezoidal,

$$\int_1^7 \frac{1}{\sqrt{x^3+1}}\,dx \approx \frac{1}{2}\left[0.7071 + 2(0.3333) + 2(0.1889) + 2(0.1240) + 2(0.0891) + 2(0.0678) + 0.0539\right]$$

$$\approx 1.1836$$

$$\approx 1.184 \quad \text{(Answer)}$$

c) $\int_3^5 \frac{1}{1-\ln x}\,dx \quad (n=4)$

Here, $a=3,\ b=5,\ n=4$

$$\Delta x = \frac{5-3}{4} = 0.5$$

RS $[x_{r-1}, x_r]$	Left		right		middle	
	C_r	$f(C_r)$	C_r	$f(C_r)$	C_r	$f(C_r)$
3, 3.5	3	-10.141	3.5	-3.956	3.25	-5.597
3.5, 4	3.5	-3.956	4	-2.581	3.75	-3.108
4, 4.5	4	-2.581	4.5	-1.984	4.25	-2.238
4.5, 5	4.5	-1.984	5	-1.641	4.75	-1.792
$\sum f(C_r)$		-78.662		-10.162		-12.735
$\Delta x * \sum f(C_r)$		-9.331		-5.081		-6.3675

Trapezoidal $\int_3^5 \frac{1}{1-\ln x}\,dx \approx \frac{0.5}{2}[-10.141 + 2(-3.956) + 2(-2.581) + 2(-1.984) - 1.641]$

≈ -7.21

(Answer)

d) $\int_0^1 \sin(x)\cos(x^2)\,dx$ $(n=4)$

Here, $a=0$, $b=1$, $n=4$

$$\Delta x = \frac{1-0}{4} = 0.25$$

Rs $[x_{r-1}, x_r]$	left		right		middle	
	C_r	$f(C_r)$	C_r	$f(C_r)$	C_r	$f(C_r)$
0, 0.25	0	0	0.25	0.0049	0.125	0.0022
0.25, 0.50	0.25	0.0049	0.50	0.0087	0.375	0.0065
0.50, 0.75	0.50	0.0087	0.75	0.0131	0.625	0.0109
0.75, 1	0.75	0.0131	1	0.0174	0.875	0.0153
$\sum f(C_r)$		0.0262		0.0409		0.0349
$\Delta x * \sum f(C_r)$		0.000655		0.0102		0.00087

Trapezoidal

$$\int_0^1 \sin(x)\cos(x^2)\,dx \approx \frac{0.25}{2}[0+2(0.0049)+2(0.0087)+2(0.0131)+0.0174]$$

$$\approx 0.0087$$ (Answer)

e) $\int_0^1 \sin(x^2)\,dx \quad (n=5)$

Here, $a=0,\ b=1,\ n=5$

$$\Delta x = \frac{1-0}{5} = 0.2$$

$Rs_{[X_{n-1}, X_n]}$	left		right		middle	
	C_n	$f(C_n)$	C_n	$f(C_n)$	C_n	$f(C_n)$
0, 0.2	0	0	0.2	0.0007	0.1	0.00017
0.2, 0.4	0.2	0.0007	0.4	0.0028	0.3	0.00157
0.4, 0.6	0.4	0.0028	0.6	0.0063	0.5	0.00936
0.6, 0.8	0.6	0.0063	0.8	0.0112	0.7	0.00855
0.8, 1	0.8	0.0112	1	0.0174	0.9	0.1414
$\sum f(C_n)$		0.021		0.0389		0.15605
$\Delta x * \sum f(C_n)$		0.00042		0.000768		0.03121

Trapezoidal $\int_0^1 \sin(x^2)\,dx \approx \frac{0.2}{2}[0+2(0.0007)+2(0.0028)+2(0.0063)+2(0.0112)+0.0174]$

≈ 0.00059

≈ 0.0006 (Answer)