Integration: exam practice

10 questions · 31 marks · worked solutions and markschemes

Name _____ Date _____ Score / 31

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/slai/integration-exam-practice

1. **2 marks · Paper 1 style · calculator allowed**

Find $\int \frac{3}{x^2}\,dx$. **[2]**

2. **3 marks · Paper 1 style · calculator allowed**

Find $\int (6x^2 - 4x + 1)\,dx$. **[3]**

3. **3 marks · Paper 1 style · calculator allowed**

Use your calculator to find the area of the region enclosed by $y = 9 - x^2$ and the x-axis. **[3]**

4. **3 marks · Paper 1 style · calculator allowed**

Find the value of $\int_1^3 (2x+1)\,dx$. **[3]**

5. **3 marks · Paper 1 style · calculator allowed**

The table gives values of a function f.

x	0	1	2	3	4
$f(x)$	2	3	5	4	1

Use the trapezoidal rule with 4 intervals to estimate $\int_0^4 f(x)\,dx$. **[3]**

6. **3 marks · Paper 2 style · calculator allowed**

Let $f(x) = x^3 - 4x$.

Find the area of the region between the graph of f and the x-axis for $0 \le x \le 2$. **[3]**

7. **3 marks · Paper 1 style · calculator allowed**

Water flows into a tank at a rate of $r(t) = 3t^2 + 2$ litres per minute, t minutes after a tap is opened.

Find the amount of water that flows into the tank in the first 4 minutes. **[3]**

8. 3 marks · Paper 1 style · calculator allowed

The speed of a car, v m s^{-1}, is recorded every 10 seconds.

t (s)	0	10	20	30	40
v (m s^{-1})	0	8	14	18	20

Use the trapezoidal rule to estimate the distance travelled in the 40 seconds. **[3]**

9. 4 marks · Paper 1 style · calculator allowed

Given that $f'(x) = 4x^3 - 2$ and $f(1) = 5$, find $f(x)$. **[4]**

10. 4 marks · Paper 2 style · calculator allowed

Let $f(x) = \dfrac{1}{1 + x^2}$.

(a) Use the trapezoidal rule with 4 intervals to estimate $\displaystyle\int_0^2 f(x)\,dx$. **[3]**

(b) Use your calculator to find the value of the integral. **[1]**

Answers and worked solutions

Question 1 — 2 marks

Answer: $-\frac{3}{x}+C$

$\int 3x^{-2}\,dx$ (M1)

$-\frac{3}{x}+C$ A1

Question 2 — 3 marks

Answer: $2x^3-2x^2+x+C$

$2x^3$ A1

$-2x^2+x$ A1

$+C$ A1

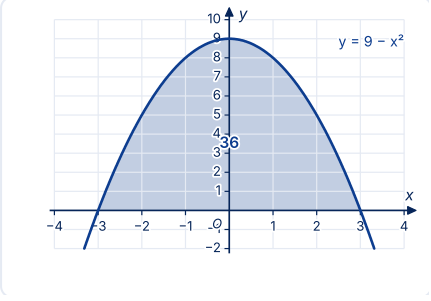
Question 3 — 3 marks

Answer: 36

limits $x=\pm 3$ (A1)

$\int_{-3}^{3}(9-x^2)\,dx$ (M1)

36 A1



Area from -3 to 3: 36

Question 4 — 3 marks

Answer: 10

$\left[x^2+x\right]_1^3$ (A1)

$12-2$ (M1)

10 A1

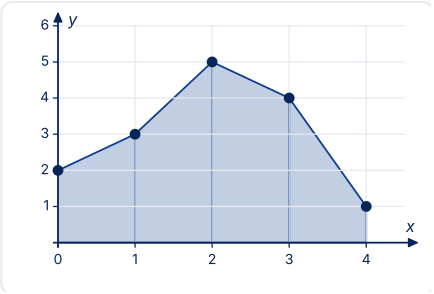
Question 5 — 3 marks

Answer: 13.5

$h=1$ (A1)

$\frac{1}{2}(2+1)+(3+5+4)$ (M1)

13.5 A1



Trapezoidal rule: four strips of width 1

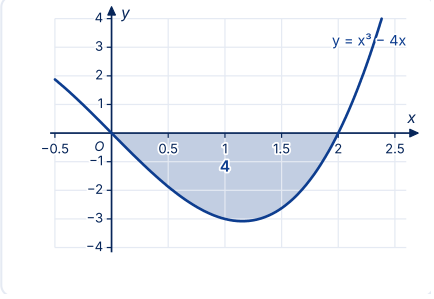
Question 6 — 3 marks

Answer: 4

the region is below the axis (R1)

$\left|\int_0^2 (x^3-4x)\,dx\right|$ (M1)

4 A1



Below the axis: area $=|-4|=4$

Question 7 — 3 marks

Answer: 72 litres

$\int_0^4 (3t^2+2)\,dt$ (M1)

$\left[t^3+2t\right]_0^4$ (A1)

72 litres A1

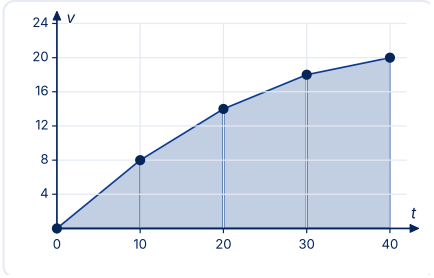
Question 8 — 3 marks

Answer: $500\ m$

$h=10$ (A1)

$\frac{10}{2}(0+20)+10(8+14+18)$ (M1)

$500\ m$ A1



Distance = area under the speed-time graph

Question 9 — 4 marks

Answer: x^4-2x+6

$f(x)=x^4-2x+C$ A1A1

$1-2+C=5$ M1

$f(x)=x^4-2x+6$ A1

Question 10 — 4 marks

Answer: (a) 1.10; (b) 1.11

(a)

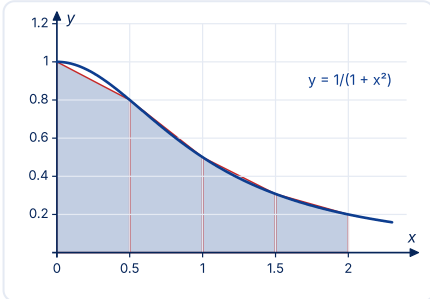
$h=0.5$ (A1)

$\frac{0.5}{2}(1+0.2+2(0.8+0.5+0.3077))$ (M1)

$1.10\ (1.1038\ldots)$ A1

(b)

$1.11\ (1.1071\ldots)$ A1



Four strips: estimate 1.10

Every solution is also on ibmathrevision.com/slai/integration-exam-practice

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