

**Integration (6 marks each)**

Use integration by parts to find the following integrals:

**1**

$$\int 4x^2 \sin(x) \, dx$$

**2**

$$\int \ln x \, dx$$

Use the provided substitution to find the following integrals:

**3**

$$\int (2x + 3) \cdot e^{x^2+3x} \, dx; u = x^2 + 3x$$

**4**

$$\int_0^2 \frac{x^3 \cdot \cos(x^2)}{(1+x^2)^2} \, dx; u = 1+x^2$$

## Marking Scheme

### Section 1: Integration by Parts

1.

$$\int 4x^2 \sin(x) dx$$

- Identification of parts (u and dv): 1 mark
- Correct differentiation of u and integration of dv: 1 mark
- Application of the integration by parts formula: 2 marks
- Final answer: 2 marks

Total: 6 marks

2.

$$\int \ln(x) dx$$

- Identification of parts (u and dv): 1 mark
- Correct differentiation of u and integration of dv: 1 mark
- Application of the integration by parts formula: 2 marks
- Final answer: 2 marks

Total: 6 marks

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### Section 2: Integration by Substitution

3.

$$\int (2x + 3) \cdot e^{x^2+3x} dx \quad \text{with} \quad u = x^2 + 3x$$

- Correct substitution (  $u = x^2 + 3x$  ): 1 mark
- Calculation of ( du ) and substitution into the integral: 2 marks
- Correct integration and final answer: 3 marks

Total: 6 marks

4.

$$\int_0^2 \frac{x^3 \cdot \cos(x^2)}{(1+x^2)^2} dx \quad \text{with} \quad u = 1 + x^2$$

- Correct substitution (  $u = 1 + x^2$  ): 1 mark
- Calculation of ( du ) and adjustment of limits: 2 marks
- Correct integration and final answer: 3 marks

Total: 6 marks

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