Integration – Test 2c – (Parts, Substitution)

OCR **C4**

Recommended Time: 40 minutes

1) **Integrate** the following

a) $\int_0^{\frac{\pi}{4}} \cos x \ \mathrm{d}x$ b) $\int \sec^2 x \, \mathrm{d}x$ (2, 1)

c) $\int \sin(3x+5) \, \mathrm{d}x$ d) $\int xe^x \ \mathrm{d}x$ (1, 2)

e) $\int x \sin x \, \mathrm{d}x$ (2)

f) $\int \frac{\ln x}{x} \mathrm{d}x$ *Hint: use the substitution u = lnx* (2)

g) $\int x^5 e^{x^6} \ \mathrm{d}x$ *Hint: use the substitution u = x^6* (2) **12**

2) **Integrate** the following:

a) $\int_0^{\frac{\pi}{4}} x^3 \sin(x^4) \, \mathrm{d}x$ *Hint: use the substitution u = x^4* (3)

b) $\int_0^{\frac{\pi}{4}} (1+\sin x) \, \mathrm{d}x$ *Leave your answer **exactly,** using surds and π* (3) **6**

3) **Integrate** the following:

a) $\int e^x \sin x \ \mathrm{d}x$ *Hint: integrate by parts twice to get back to the original integral*

(5)

b) $\int \sin x \cos^3 x \, \mathrm{d}x$ *Hint: use the substitution u = cosx* (3) **8**

4) a) By considering ln$x$ as $1 \times \ln x$ show that $\int \ln x \, \mathrm{d}x = x\ln(x) - x + \mathrm{C}$

Hint: Integrate by parts. (3)

Use the result in a) to integrate the following:

b) $\int \ln x^2 \, \mathrm{d}x$ *Hint: this question should take no more than 30 seconds!* (1)

c) $\int (\ln x)^2 \, \mathrm{d}x$ *Hint: integrate by parts using the fact that* $\int \ln x \ dx = x\ln(x) - x$

(2) **6**

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