Solutions

School of Mathematics and Statistics
Carleton University
Math. 1004A, Fall 2016
TEST 4

Only calculators are permitted, 1 or more blank sheets permitted for roughs

Print Name : _____

Student Number: _____

Tutorial Section (A1, A4, ...): _____

Show all work here and give details.

1. [5 marks] Evaluate $\int_0^1 x\,e^{-x}\,dx$ using any method

$= I$

$u = x \quad dv = e^{-x}dx$
$du = dx \quad v = -e^{-x}$
$I = -xe^{-x} - \int(-e^{-x})\,dx$
$= -xe^{-x} + \int e^{-x}dx$
$= -xe^{-x} - e^{-x} + C$

OR

$x \;(+) \to e^{-x}$
$1 \;(-) \to -e^{-x}$
$0 \leftarrow e^{-x}$
$I = -xe^{-x} - e^{-x} + \int 0\cdot e^{-x}dx$
$= -xe^{-x} - e^{-x} + C$

Answer: $\frac{e-2}{2}$

2. [5 marks] Evaluate $\int \ln(2x)\,dx$ using any method

$= I$

$u = \ln 2x \quad dv = dx$
$du = \frac{1}{2x}\cdot 2\,dx \quad v = x$
$du = \frac{1}{x}dx$
$I = x\ln 2x - \int x\cdot\frac{1}{x}dx$
$= x\ln 2x - x + C$

OR

$\ln 2x \;(+) \to 1$
$\frac{1}{x} \;(-) \leftarrow x$
$I = x\ln 2x - \int\left(\frac{1}{x}\right)x\,dx$
$= x\ln 2x - x + C$

3. [5 marks] Evaluate $\int_0^{\pi} x\sin(2x)\,dx$ using any method

Easier using Table Method →

$x \;(+) \to \sin 2x$
$1 \;(-) \to -\frac{\cos 2x}{2}$
$0 \to -\frac{\sin 2x}{4}$

$I = -\frac{x\cos 2x}{2} + \frac{\sin 2x}{4} + C$

Answer: $-\pi/2$

4. [5 marks] Evaluate $\int x^2 e^{2x}\,dx$ using any method

Easier using Table Method.

$x^2 \;(+) \to e^{2x}$
$2x \;(-) \to e^{2x}/2$
$2 \;(+) \to e^{2x}/4$
$0 \to e^{2x}/8$

$I = x^2\frac{e^{2x}}{2} - x\frac{e^{2x}}{2} + \frac{e^{2x}}{4} + C$