

For Administration Use (*To be completed by the TA / invigilator*)

Session **A**: 15:00–17:00

Session **B**: 17:00–19:00

The University of Toronto Mississauga and you, as a student, share a commitment to academic integrity. You are reminded that you may be charged with an academic offence for possessing any unauthorized aids during the writing of a test and/or for revealing the test materials to other students or to any unauthorized institution.

*Please note, once this test has begun, you **CANNOT** re-write it.*

Session A: 15:00–17:00**Question A1** (5 points)

Recall that $\mathbb{R}[x]$ is the set of all polynomials with real coefficients in the variable x .

Let $x\mathbb{R}[x] = \{xp : p \in \mathbb{R}[x]\}$ and $I : \mathbb{R}[x] \rightarrow x\mathbb{R}[x]$ be a linear isomorphism satisfying both $I(1) = x$ and the equation

$$I(pI^{-1}(q)) = pq - I(qI^{-1}(p)) \quad \forall p, q \in x\mathbb{R}[x]$$

State and prove an explicit formula for I ; i.e, for $n \in \mathbb{N}$ and $a_0, \dots, a_n \in \mathbb{R}$, write $I(a_0 + a_1x + \dots + a_nx^n)$ in terms of the a_i and x . You may assume without proof that the inverse of a linear isomorphism is linear.

Question B1 (5 points)
Same as A1.

Session B: 17:00–19:00

Session A: 15:00–17:00**Question A2** (5 points)

Compute

$$\int e^{2t} \cos\left(\frac{1}{4}t\right) dt$$

Session B: 17:00–19:00**Question B2** (5 points)

Compute

$$\int (3t + t^2) \sin(2t) dt$$

Session A: 15:00–17:00
Question A3 (5 points)

Compute

$$\int \frac{8}{3t^3 + 7t^2 + 4t} dt$$

$$\int \frac{(3t^2 + 4)(t^2 + 7)}{8 + t + 6t^2 - 12t^3} dt$$

Question B3 (5 points)
Compute

Session B: 17:00–19:00
