Assignment 8.

By the proposed method or hints (if any), or otherwise, evaluate each of the following integrals, giving all your answers in exact forms wherever appropriate.

1. $\displaystyle\int \frac{\ln x}{x}\,\mathrm{d}x$ [3]

2. $\displaystyle\int \frac{1}{x^3 - x}\,\mathrm{d}x$; by first decomposing into partial fractions [5]

3. $\displaystyle\int_2^3 \frac{x}{x^2 + 1}\,\mathrm{d}x$; by substitution [5]

4. $\displaystyle\int_2^3 \frac{x}{x^2 - 1}\,\mathrm{d}x$ [5]

5. $\displaystyle\int_0^4 x\sqrt{2x + 1}\,\mathrm{d}x$ [5]

6. $\displaystyle\int \frac{x}{x^2 + x + 1}\,\mathrm{d}x$; by splitting into two fractions in an appropriate way and/or a suitable substitution [5]

7. $\displaystyle\int_0^{\pi^2} \sin\sqrt{x}\,\mathrm{d}x$; by using a suitable substitution, followed by integration by parts [6]

8. $\displaystyle\int_1^2 \frac{\mathrm{e}^{\frac{1}{x}}}{x^3}\,\mathrm{d}x$ [6]

9. $\displaystyle\int \mathrm{e}^{-x}\sin 2x\,\mathrm{d}x$; by applying integration by parts twice [6]

10. $\displaystyle\int_0^{\frac{\pi}{4}} \sin x\cos 2x\,\mathrm{d}x$ [6]

11. $\displaystyle\int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{x^3+x^2-x+1}{x^4-1}\,\mathrm{d}x$; by first decomposing into partial fractions [8]

12. (†) $\displaystyle\int \frac{\ln x\,\mathrm{d}x}{(1+x^2)^{\frac{3}{2}}}$ [8]

Total mark of this assignment: $60+8$.

The symbol (†) indicates a bonus question. Finish other questions before working on this one.