

SwInBee 2023

Name: _____ Submission time: _____ Score: _____

Instructions

1. Duration: 1 hour.
2. Record your answers on this answer sheet.
3. No materials allowed besides pens and pencils. Paper will be supplied for rough working.
4. No partial marks awarded. This includes the “+ C” for indefinite integrals: if an appropriate constant is not included then you will get zero.
5. In the event of papers achieving the same score, the tie-breaker will be the order of submission, with earlier papers ranked higher.

Integrals

1. $\int_0^{\pi} (2x + \pi)^{100} dx$

2. $\int e^{-3x} (1 + 2e^{-x})^2 dx$

3. $\int_0^{1/2} \sqrt{1 - 4x^2} dx$

4. $\int \sin^3 x dx$

5. $\int \sin x \cos x dx$

6. $\int e^x \sin x dx$

7. $\int x^2 e^x \cos x dx$

8. $\int \ln \sqrt{1 + \sqrt{1 + x}} dx$

$$9. \int \frac{1}{1 - \tan^2 x} dx$$

$$10. \int x^2 \arcsin x dx$$

$$11. \int \frac{1}{(x+1)(x+2)(x+3)} dx$$

$$12. \int x \sin x \cos x dx$$

$$13. \int x^2 \sin(\sin(x^3)) \cos(x^3) dx$$

$$14. \int (\tan^2(x) + \sin^2(x) + \sec^2(x) + \csc^2(x) + \cot^2(x) + \cos^2(x)) dx$$

$$15. \int \frac{e^x - 1}{e^x + 1} dx$$

$$16. \int \frac{dx}{x^8(x^2 + 1)}$$

$$17. \int \exp(5 \ln x) dx$$

$$18. \int \frac{\ln x}{x^a} dx, \quad a \neq 1$$

$$19. \int e^{-e^x} e^x dx$$

$$20. \int_0^u \frac{x}{1 + \frac{x}{1 + \frac{x}{1 + \dots}}} dx, \quad \text{Note: } 0 < u < 1/4.$$