SwInBee 2025

Name: _____ **Score:** _____

Instructions

1. Duration: 50 minutes.
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.

Integrals

1. $\int x^{2025} - 2025^x \, dx$

2. $\int x^{2025} \ln x \, dx$

3. $\int \frac{x + 2025}{x - 2025} \, dx$

4. $\int_{-\infty}^{\infty} e^{-4x^2+8x-5} \, dx$ (*Hint*: you may use the fact that $\int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi}$)

5. $\int \frac{x}{9 + 4x^4} \, dx$

6. $\int \frac{1}{x(5x^2 + 4)} \, dx$

7. $\int \frac{x}{(2 + 3x^2)^2} \, dx$

8. $\int \cos^4 x - \sin^4 x \, dx$

9. $\displaystyle\int_0^\infty \frac{dx}{1+e^x}$

10. $\displaystyle\int e^x \sin x \, dx$

11. $\displaystyle\int \ln(2+x^2)\, dx$

12. $\displaystyle\int \frac{e^{-1/x^2}}{x^5}\, dx$

13. $\displaystyle\int_0^1 \frac{x^4(x-1)^4}{x^2+1}\, dx$

14. $\displaystyle\int \sinh x \, \cosh x \, dx$

15. $\displaystyle\int_0^1 \sum_{n=2}^{\infty} \frac{1}{(x+n)(x+n+1)}\, dx = \int_0^1 \left[\frac{1}{(x+2)(x+3)} + \frac{1}{(x+3)(x+4)} + \frac{1}{(x+4)(x+5)} + \cdots\right] dx$

16. $\displaystyle\int \frac{1}{x(\ln x)^2}\, dx$

17. $\displaystyle\int \frac{x+4}{(x-1)^2}\, dx$

18. $\displaystyle\int \frac{1}{(x^2-1)(x^2-4)}\, dx$

19. $\displaystyle\int \tan(3x)\, dx$

20. $\displaystyle\int \frac{1}{x^3(x^2+1)}\, dx$