SwInBee 2018

Name:

Instructions

1. Duration: 1 hour.
2. No materials allowed besides pens and pencils. Paper will be supplied for rough working.
3. No partial marks awarded. This includes the "+ C" for indefinite integrals: if an appropriate constant is not included then you will get zero.
4. A prize of $25 will be given for solution of the prize question, with the tie-breaker for multiple correct answers being the total number of points.

Integrals

1. $\int \sqrt{x} e^{x\sqrt{x}}\, dx =$

2. $\int \frac{1}{\sqrt{x}} \left(\ln \sqrt{x} + \frac{1}{x} \right) dx =$

3. $\int \sinh x \arctan(\sinh x)\, dx =$

4. $\int \frac{dx}{x^3 + x} =$

5. $\int \frac{1 + e^x}{e^x - 1}\, dx =$

6. $\int e^x \cos(\cos(e^x)) \sin(e^x)\, dx =$

7. $\int \frac{x^3}{1 + x^2}\, dx =$

8. $\int \ln \left(\frac{1+x}{1-x} \right) dx =$

9. $\displaystyle\int \frac{1-\cos x}{\sin\frac{x}{2}}\,dx =$

10. $\displaystyle\int \frac{x^2}{2}\ln\left(\frac{2}{x^2}\right)\,dx =$

11. $\displaystyle\int \frac{dx}{x^2-1} =$

12. $\displaystyle\int \frac{\sinh x\cos(\cosh x)}{\sin^2(\cosh x)}\,dx =$

13. $\displaystyle\int \frac{dx}{\sqrt{7-x^2}} =$

14. $\displaystyle\int_{-2\pi}^{2\pi}(x^3\cos 4x-(x^4+x^2+1)\sin 3x)\,dx =$

15. $\displaystyle\int x^8 e^{x^3}\,dx =$

16. $\displaystyle\int_0^{2018}|\sin(2018\pi x)|\,dx =$

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

18. $\displaystyle\int (x(x(x(x(\cdots)^{1/2})^{1/2})^{1/2})^{1/2})^{1/2}\,dx =$

19. $\displaystyle\int \cos^8 x\,dx =$

20. **Prize question!** $\displaystyle\int_{-\infty}^{\infty} e^{-3x^2}\,dx =$