Integration Competition Sample Problems

1. $\displaystyle\int_0^1 \frac{x^5-1}{\ln x}\mathrm{d}x$

2. $\displaystyle\int_0^\infty \frac{\sin x}{x}\mathrm{d}x$

3. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\mathrm{d}x$

4. $\displaystyle\int_0^\infty \frac{\ln x}{x^2+1}\mathrm{d}x$

5. $\displaystyle\int_1^2 \frac{\ln x}{2-2x+x^2}\mathrm{d}x$

6. $\displaystyle\int_0^1 \frac{\ln(1-x)}{x}\mathrm{d}x$

7. $\displaystyle\int_0^\infty x^{n-1}e^{-x}\mathrm{d}x$ where $n\in\mathbb{Z}^+$. This is the Gamma function, $\Gamma(n)$.

8. $\displaystyle\int_0^\infty \frac{x^{s-1}}{e^x-1}\mathrm{d}x$

9. $\displaystyle\int_1^\infty \frac{x-\lfloor x\rfloor}{x^4}\mathrm{d}x$ where $\lfloor x\rfloor$ is the greatest integer smaller than x.

10. $\displaystyle\int_{-2}^2 \left(x^3\cos\frac{x}{2}+\frac{1}{2}\right)\sqrt{4-x^2}\mathrm{d}x$

11. $\displaystyle\int \frac{\mathrm{d}x}{1+\tan x}$

12. $\displaystyle\int \frac{\sqrt{\tan x}}{\sin(2x)}\mathrm{d}x$

13. $\displaystyle\int \frac{\mathrm{d}x}{1+e^x}$

14. $\displaystyle\int \frac{1}{x(1+\sin^2(\ln x))}\mathrm{d}x$

15. $\int \frac{1}{x^3+1}\mathrm{d}x$

16. $\int \frac{\mathrm{d}x}{2+\sin x}$

17. $\int x^{\frac{1}{\ln x}}\mathrm{d}x$

18. $\int \frac{\mathrm{d}x}{1-\sin x}$

19. $\int x\sqrt{\frac{1-x^2}{1+x^2}}\mathrm{d}x$

20. $\int \frac{e^{2x}+e^{3x}}{e^x+e^{-x}}\mathrm{d}x$