INTEGRATION BEE 2021 WRITTEN EXAM

Unless otherwise specified, assume natural domain restrictions. Logical explanation may be a sufficient substitute for working. $+C$ is not necessary.

(1) $\displaystyle \int \frac{1}{\sqrt{e^x - 1}}\,dx$

(2) $\displaystyle \int 2021x \sin(x^2)\,dx$

(3) $\displaystyle \int \frac{\ln(x)}{x^2}\,dx$

(4) $\displaystyle \int \frac{1}{-x^{-1} + x^{-2} - x^{-3} + \ldots}\,dx, \ |x| > 1$

(5) $\displaystyle \int \frac{1}{(x^2 + 25)^{3/2}}\,dx$

(6) $\displaystyle \int_0^3 x|x|\lceil x \rceil \sqrt{\lfloor x \rfloor}\,dx$

(7) $\displaystyle \int x^{21} e^x\,dx$

(8) $\displaystyle \int_2^4 \frac{\sqrt{\ln(9 - x)}}{\sqrt{\ln(9 - x)} + \sqrt{\ln(x + 3)}}\,dx$

(9) $\displaystyle \int (x + 1)^2 \left(\frac{x}{x - 1}\right)^3\,dx$

(10) $\displaystyle \int e^{3x} \sin(x + 2)\,dx$

(11) $\displaystyle \int_0^\infty x^{201} e^{-x}\,dx$

(12) $\displaystyle\int_{-\pi}^{\pi} \frac{\sin(\frac{5x}{2})}{\sin(\frac{x}{2})}dx$

(13) $\displaystyle\int e^x \sin(e^x)dx$

(14) $\displaystyle\int \sqrt{\frac{1-x}{1+x}}dx$

(15) $\displaystyle\int \sqrt{x^2+8x}dx$

(16) $\displaystyle\int \frac{\ln x}{(x+5)^2}dx$

(17) $\displaystyle\int (x+5)^2 \ln x\, dx$

(18) $\displaystyle\int_{-\infty}^{\infty} e^{-x^2}dx$

(19) $\displaystyle\int \cos^4 x - \sin^4 x\, dx$

(20) $\displaystyle\int \frac{e^x}{1+e^x}dx$

(21) $\displaystyle\int \cos(\sqrt{x})dx$

(22) $\displaystyle\int_{-2}^{2} \tanh(x)\, dx$

(23) $\displaystyle\int_0^1 5^{\ln 2x}dx$

(24) $\displaystyle\int_{-0.5}^{0.5} x\cos\left(e^{x^2}\sin x\right)\tan\left(e^{\cos x}\right)dx$

(25) $\displaystyle\int \frac{x}{x^4+1}dx$

(26) $\displaystyle\int 5\sec(4x)\tan(4x)dx$

(27) $\displaystyle\int \frac{1}{\sqrt[3]{x}\,(x+8)}dx$

(28) $\displaystyle\int \frac{e^{-x}-e^x}{e^{-2x}+e^{2x}+2}dx$

(29) $\displaystyle\int \frac{dx}{|x|\sqrt{x^2-3}}$

(30) $\displaystyle\int \frac{\sin^2(x)}{\sqrt{1-\cos(x)}}dx$