Name: Richard

QUIZ 25¢

MATH 200
December 3, 2024

1. $\int \frac{(\ln|x|)^3}{x}\,dx = \int (\ln|x|)^3 \frac{1}{x}\,dx = \int u^3\,du = \frac{u^4}{4} + C = \boxed{\frac{(\ln|x|)^4}{4} + C}$

$u = \ln|x|$
$\frac{du}{dx} = \frac{1}{x}$
$du = \frac{1}{x}\,dx$

2. $\int e^x\sqrt{e^x+1}\,dx = \int (e^x+1)^{\frac{1}{2}} e^x\,dx = \int u^{\frac{1}{2}}\,du = \frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C$

$u = e^x + 1$
$\frac{du}{dx} = e^x$
$du = e^x\,dx$

$= \frac{u^{3/2}}{\frac{3}{2}} + C = \frac{2\sqrt{u}^3}{3} + C = \boxed{\frac{2\sqrt{e^x+1}^3}{3} + C}$

3. $\int \frac{x+e^x}{x^2+2e^x}\,dx = \int \frac{1}{x^2+2e^x}\frac{1}{2}(x+e^x)\,dx = \int \frac{1}{u}\frac{1}{2}\,du = \frac{1}{2}\int \frac{1}{u}\,du$

$u = x^2 + 2e^x$
$\frac{du}{dx} = 2x + 2e^x$
$du = (2x+2e^x)\,dx \rightsquigarrow \frac{1}{2}du = (x+e^x)\,dx$

$= \frac{1}{2}\ln|u| + C = \boxed{\frac{1}{2}\ln\left|x^2+2e^x\right| + C}$

4. $\int_0^{\frac{\sqrt{\pi}}{2}} x\sec^2(x^2)\,dx = \int_0^{\frac{\sqrt{\pi}}{2}} \sec^2(x^2)\,x\,dx = \int_{0^2}^{\left(\frac{\sqrt{\pi}}{2}\right)^2} \sec^2(u)\frac{1}{2}\,du$

$u = x^2$
$du = 2x\,dx$
$\frac{1}{2}du = x\,dx$

$= \frac{1}{2}\int_0^{\frac{\pi}{4}} \sec^2(u)\,du = \frac{1}{2}\left[\tan(u)\right]_0^{\pi/4}$

$= \frac{1}{2}\left(\tan\left(\frac{\pi}{4}\right) - \tan(0)\right) = \frac{1}{2}(1-0) = \boxed{\frac{1}{2}}$

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1. $\int \frac{\sec^2(\ln|x|)}{x}\,dx = \int \sec^2(\ln|x|)\frac{1}{x}\,dx = \int \sec^2(u)\,du$

$u = \ln|x|$
$\frac{du}{dx} = \frac{1}{x}$
$du = \frac{1}{x}\,dx$

$= \tan(u) + c = \boxed{\tan(\ln|x|) + C}$

2. $\int \cos^5(x)\sin(x)\,dx = \int (\cos(x))^5 \sin(x)\,dx = \int u^5(-du) = -\int u^5\,du$

$u = \cos(x)$
$\frac{du}{dx} = -\sin(x)$
$-du = \sin(x)\,dx$

$= \frac{-u^6}{6} + C = \frac{-(\cos(x))^6}{6} + C$

$= \boxed{\frac{-1}{6}\cos^6(x) + C}$

3. $\int \frac{6x^2+6x}{2x^3+3x^2+6}\,dx = \int \frac{1}{2x^3+3x^2+6}(6x^2+6x)\,dx = \int \frac{1}{u}\,du$

$u = 2x^3+3x^2+6$
$\frac{du}{dx} = 6x^2+6x$
$du = (6x^2+6x)\,dx$

$= \ln|u| + C = \boxed{\ln|2x^3+3x^2+6| + C}$

4. $\int_0^1 xe^{x^2-1}\,dx = \int_0^1 e^{x^2-1}x\,dx = \int_{0^2-1}^{1^2-1} e^u \frac{1}{2}\,du = \frac{1}{2}\int_{-1}^{0} e^u\,du$

$u = x^2-1$
$\frac{du}{dx} = 2x$
$du = 2x\,dx$
$\frac{1}{2}du = x\,dx$

$= \frac{1}{2}\left[e^u\right]_{-1}^{0} = \frac{1}{2}\left(e^0 - e^{-1}\right)$

$= \frac{1}{2}\left(1 - \frac{1}{e}\right) = \frac{1}{2} - \frac{1}{2e} = \boxed{\frac{e-1}{2e}}$