Name: Richard

QUIZ 21

MATH 200
November 14, 2023

1. $\lim\limits_{x\to 1} x^{1/(x-1)} = \lim\limits_{x\to 1} e^{\ln\left(x^{1/(x-1)}\right)} = \lim\limits_{x\to 1} e^{\frac{1}{(x-1)}\ln(x)}$

form 1^{∞}

$= \lim\limits_{x\to 1} e^{\frac{\ln(x)}{x-1}} = e^{\lim\limits_{x\to 1}\frac{\ln(x)}{x-1}}$

form $\frac{0}{0}$

$= e^{\lim\limits_{x\to 1}\frac{\frac{1}{x}}{1-0}} = e^{\frac{\frac{1}{1}}{1}} = e^{1} = \boxed{e}$

2. $\int \left(8x^3 - \frac{1}{x} + x + 3\right) dx = \frac{8x^4}{4} - \ln|x| + \frac{x^2}{2} + 3x + C$

$= \boxed{2x^4 - \ln|x| + \frac{x^2}{2} + 3x + C}$

3. $\int (2\cos(x) + e^x)\, dx = \boxed{2\sin(x) + e^x + C}$

4. $\int \left(\sqrt[5]{x} + \frac{1}{x^2}\right) dx = \int \left(x^{\frac{1}{5}} + x^{-2}\right) dx = \frac{x^{\frac{1}{5}+1}}{\frac{1}{5}+1} + \frac{x^{-2+1}}{-2+1} + C$

$= \frac{x^{\frac{6}{5}}}{\frac{6}{5}} + \frac{x^{-1}}{-1} + C = \boxed{\frac{5\sqrt[5]{x}^{6}}{6} - \frac{1}{x} + C}$

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1. $\lim_{x\to 0^+} x^{(x^2)} = \lim_{x\to 0^+} e^{\ln(x^{(x^2)})} = \lim_{x\to 0^+} e^{x^2\ln(x)}$

form 0^0

$= e^{\lim_{x\to 0^+} x^2 \ln(x)}$

form $0\cdot\infty$

$= e^{\lim_{x\to 0^+} \frac{\ln(x)}{\frac{1}{x^2}}} = e^{\lim_{x\to 0^+} \frac{\frac{1}{x}}{\frac{-2}{x^3}}} = e^{\lim_{x\to 0^+} -\frac{x^3}{2x}}$

form $\frac{\infty}{\infty}$

$= e^{\lim_{x\to 0^+} -\frac{x^2}{2}} = e^0 = \boxed{1}$

2. $\int \left(4x^3 - x + 2 + \frac{2}{x}\right) dx = 4\frac{x^4}{4} - \frac{x^2}{2} + 2x + 2\ln|x| + C$

$= \boxed{x^4 - \frac{x^2}{2} + 2x + 2\ln|x| + C}$

3. $\int (e^x + \csc^2(x))\, dx = \boxed{e^x - \cot(x) + C}$

4. $\int \left(\frac{1}{x^3} + \sqrt{x}\right) dx = \int\left(x^{-3} + x^{\frac{1}{2}}\right)dx = \frac{x^{-3+1}}{-3+1} + \frac{x^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C$

$= \frac{x^{-2}}{-2} + \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + C = \boxed{-\frac{1}{2x^2} + \frac{2\sqrt{x}^3}{3} + C}$