Name: Richard

QUIZ 21

MATH 200
November 12, 2024

1. $\lim_{x\to 0^+} (3x+1)^{1/x}$

form 1^∞

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

$= \lim_{x\to 0^+} e^{\frac{\ln|3x+1|}{x}} = e^{\lim_{x\to 0^+} \frac{\ln|3x+1|}{x}}$

form $\frac{0}{0}$

$= e^{\lim_{x\to 0^+} \frac{\frac{3}{3x+1}}{1}} = e^{\lim_{x\to 0} \frac{3}{3x+1}}$

$= e^{\frac{3}{0+1}} = \boxed{e^3}$

2. $\int \sqrt{x}\,dx = \int x^{1/2}\,dx = \frac{x^{1/2+1}}{\frac{1}{2}+1} + C = \frac{x^{3/2}}{\frac{3}{2}} + C = \boxed{\frac{2\sqrt{x^3}}{3} + C}$

3. $\int \left(e^x - 2 + \sec(x)\tan(x)\right) dx = \boxed{e^x - 2x + \sec(x) + C}$

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

$= \boxed{\ln|x| - \frac{1}{x} + C}$

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1. $\lim_{x\to\infty} (3x+1)^{1/x} = \lim_{x\to\infty} e^{\ln|(3x+1)^{1/x}|} = \lim_{x\to\infty} e^{\frac{1}{x}\ln|3x+1|}$

form ∞^0

$= \lim_{x\to\infty} e^{\frac{\ln|3x+1|}{x}} = e^{\lim_{x\to\infty} \frac{\ln|3x+1|}{x}}$

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

$= e^{\lim_{x\to\infty} \frac{\frac{3}{3x+1}}{1}} = e^{\lim_{x\to\infty} \frac{3}{3x+1}}$

$= e^0 = \boxed{1}$

2. $\int (2x^7 - x + 4e^x)\,dx = 2\frac{x^8}{8} - \frac{x^2}{2} + 4e^x + C = \boxed{\frac{x^8}{4} - \frac{x^2}{2} + 4e^x + C}$

3. $\int (5 + \sec^2(x))\,dx = \boxed{5x + \tan(x) + C}$

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

$= \boxed{\ln|x| - \frac{1}{2x^2} + C}$