Integral Test Transcripts

Problem Statement

LLMs are asked to solve the following integral:

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

Correct Solution:

$$\frac{1}{2}\tan^2(\ln|x|) + \ln|\cos(\ln|x|)| + C$$

1 Transcripts

Gemma3:1b

Let $I = \int \tan^3(\ln(x))dx$. We can use substitution to solve this integral. Let $u = \ln(x)$. Then $du = \frac{1}{x}dx$. Thus, $dx = xdu$. Substituting into the integral, we get: $I = \int \tan^3(u)(xdu) = \int \tan^2(u)\tan(u)du = \int \sec^2(u)\tan^2(u)du$. Let $v = \tan(u)$. Then $dv = \sec^2(u)du$. Substituting into the integral, we get: $I = \int \sec^2(u)v^2du = \int v^2dv = v^2 + C = \tan^2(u) + C$. Now substitute back $u = \ln(x)$: $I = \tan^2(\ln(x)) + C$.

Thus, $\int \tan^3(\ln(x))dx = \tan^2(\ln(x)) + C$.

Final Answer: The final answer is $\tan^2(\ln(x)) + C$

Gemma3:4b

Let the integral be $I = \int \frac{\tan^3(\ln(x))}{x}dx$. Let $u = \ln(x)$, then $\frac{du}{dx} = \frac{1}{x}$, so $du = \frac{1}{x}dx$. Substituting these into the integral, we have $I = \int \tan^3(u)du$. Now we can rewrite this as $I = \int \tan^3(u)du = \int \tan^2(u)\tan(u)du$. We know that $\tan^2(u) = \sec^2(u) - 1$, so $I = \int(\sec^2(u) - 1)\tan(u)du = \int \sec^2(u)\tan(u)du - \int \tan(u)du$. For the first integral, let $v = \tan(u)$, then $dv = \sec^2(u)du$. Therefore, $\int \sec^2(u)\tan(u)du = \int vdv = \frac{v^2}{2} + C_1 = \frac{\tan^2(u)}{2} + C_1$. For the second integral, we have $\int \tan(u)du = \int \frac{\sin(u)}{\cos(u)}du$. Let $w = \cos(u)$, then $dw = -\sin(u)du$. Thus, $\int \tan(u)du = -\ln|\cos(u)| + C_2$. So, $I = \frac{\tan^2(u)}{2} - (-\ln|\cos(u)|) + C = \frac{\tan^2(u)}{2} + \ln|\cos(u)| + C$.

Final Answer: The final answer is $\frac{\tan^2(u)}{2} + \ln|\cos(u)| + C$

Gemma3:12b

Let the integral be $I = \int \frac{\tan^3(\ln(x))}{x}dx$. Let $u = \ln(x)$, so $du = \frac{1}{x}dx$. Then $I = \int \tan^3(u)du$. We can rewrite $\tan^3(u)$ as $\tan^2(u)\tan(u) = (\sec^2(u)-1)\tan(u)$, so $I = \int(\sec^2(u)-1)\tan(u)du = \int \sec^2(u)\tan(u)du - \int \tan(u)du$. For the first integral, let $v = \tan(u)$, so $dv = \sec^2(u)du$. Then $\int \sec^2(u)\tan(u)du = \frac{\tan^2(u)}{2} + C_1$. For the second integral, we have $\int \tan(u)du = -\ln|\cos(u)| + C_2$. Thus $I = \frac{\tan^2(u)}{2} + \ln|\cos(u)| + C$. Substituting back $u = \ln(x)$, we get $I = \frac{\tan^2(\ln(x))}{2} + \ln|\cos(\ln(x))| + C$.

Final Answer: The final answer is $\frac{\tan^2(\ln(x))}{2} + \ln|\cos(\ln(x))| + C$

Gemma3:27b

Let the given integral be $I = \int \frac{\tan^3(\ln(x))}{x} dx$. Let $u = \ln(x)$. Then $du = \frac{1}{x} dx$. Substituting this into the integral, we have $I = \int \tan^3(u) du = \int \tan^2(u) \tan(u) du = \int (\sec^2(u) - 1) \tan(u) du$ $= \int \sec^2(u) \tan(u) du - \int \tan(u) du$. Let $v = \sec(u)$. Then $dv = \sec(u) \tan(u) du$. Then $\int \sec^2(u) \tan(u) du = \int \sec(u)(\sec(u) \tan(u)) du = \int v dv = \frac{v^2}{2} + C_1 = \frac{\sec^2(u)}{2} + C_1$. Also, $\int \tan(u) du = -\ln|\cos(u)| + C_2$. So, $I = \frac{\sec^2(u)}{2} + \ln|\cos(u)| + C$. Substituting $u = \ln(x)$ back in, we get $I = \frac{\sec^2(\ln(x))}{2} + \ln|\cos(\ln(x))| + C$.

Final Answer: The final answer is $\frac{1}{2} \sec^2(\ln(x)) + \ln|\cos(\ln(x))| + C$

Cognito V2 Preview Llama 70B

Let's solve this integral using substitution and simplifying strategies.

1) First, let's try to simplify the integrand. Note that: $\tan^3(\ln(x)) = \frac{\tan^3(\ln(x))}{\tan^2(\ln(x))+1} \cdot [1 + \tan^2(\ln(x))] = \frac{d}{dx}[\ln(x)] \cdot \tan^2(\ln(x)) + \tan(\ln(x))$

2) Therefore: $\int \frac{\tan^3(\ln(x))}{x} dx = \int \frac{1}{x}[\ln(x)]' \tan^2(\ln(x)) dx + \int \frac{\tan(\ln(x))}{x} dx$

3) For the first part, let's use substitution: Let $u = \ln(x)$. This transforms the integral into $\int \tan^2(u) du + \int \tan(u) du$.

5) For the first part: $\int \tan^2(u) du = \tan(u) - u + C$.

6) The second part: $\int \tan(u) du = -\ln|\cos(u)| + C$.

7) Combining these results: $\tan(\ln(x)) - \ln(x) + \ln|\cos(\ln(x))| + C$.

Therefore, the final answer is:

$$\int \tan^3(\ln(x)) \frac{dx}{x} dx = \tan(\ln(x)) - \ln(x) + \ln|\cos(\ln(x))| + C$$

Cognito V2 Preview Llama 405B

Let's solve this integral step by step:

1) Let $u = \ln(x)$, then $du = \frac{1}{x} dx$. Thus, $\int \frac{\tan^3(\ln(x))}{x} dx = \int \tan^3(u) du$.

2) We can write $\tan^3(u) = (\sec^2(u) - 1) \tan(u)$.

3) Therefore: $\int \tan^3(u) du = \int \tan(u) \sec^2(u) du - \int \tan(u) du$.

4) For the first integral, let $v_1 = \tan(u)$. Then $dv_1 = \sec^2(u) du$, giving $\frac{1}{2} \tan^2(u)$.

5) For the second integral: $\int \tan(u) du = -\ln|\cos(u)| + C$.

6) Combining the results: $\frac{1}{2} \tan^2(u) + \ln|\cos(u)| + C$.

7) Substituting back $u = \ln(x)$: $\frac{1}{2} \tan^2(\ln(x)) + \ln|\cos(\ln(x))| + C$.

Therefore,

$$\int \tan^3(\ln(x))/x \, dx = \frac{1}{2} \tan^2(\ln(x)) + \ln|\cos(\ln(x))| + C$$

Mistral 7B Instruct

To solve the integral $\int \frac{\tan^3(\ln x)}{x} dx$, we can use a substitution method.

1. **Substitution**: Let $u = \ln x$. Then $du = \frac{1}{x} dx$. 2. **Rewrite the Integral**: $\int \tan^3(u) du$. 3. **Simplify**: $\tan^3(u) = (\sec^2(u) - 1) \tan(u) = \sec^2(u) \tan(u) - \tan(u)$. 4. **Integrate Term by Term**: - $\int \sec^2(u) \tan(u) du = \frac{\sec^2(u)}{2} + C_1$. - $-\int \tan(u) du = -\ln|\sec(u)| + C_2$. 5. **Combine**: $\frac{\sec^2(u)}{2} - \ln|\sec(u)| + C$. 6. **Substitute Back**: $\frac{\sec^2(\ln x)}{2} - \ln|\sec(\ln x)| + C$.

Final Answer:

$$\frac{\sec^2(\ln x)}{2} - \ln|\sec(\ln x)| + C$$

Llama 3.3 70B Instruct

To solve the integral $\tan^3(\ln(x))/x\,dx$, we can use the substitution method and trigonometric identities.

Step 1: Substitute $u = \ln(x)$. Then $du = (1/x)dx$. Substituting gives $\int \tan^3(u)du$.

Step 2: Apply Trigonometric Identity. $\tan^3(u) = \tan(u)(\sec^2(u) - 1)$.

Step 3: Integrate. $\int \tan(u)\sec^2(u)du - \int \tan(u)du$. First part: $\sec(u)+C1$ (Wait, $\int \tan(u)\sec^2(u)du$ is $\frac{1}{2}\tan^2 u$ or $\frac{1}{2}\sec^2 u$, the model claims $\sec(u)$). Second part: $-\ln|\cos(u)| + C2$.

Step 4: Substitute Back. $\sec(\ln(x)) + \ln|\cos(\ln(x))| + C$.

Final Solution: The final answer is: $\sec(\ln(x)) + \ln|\cos(\ln(x))| + C$

Kimi K2 0711

Let's consider the substitution $u = \ln x \Rightarrow du = \frac{1}{x}dx$. The integral transforms into $\int \tan^3(u)\,du$.

To integrate $\tan^3(u)$, use $\tan^2(u) = \sec^2(u) - 1$: $\tan^3(u) = \tan(u)(\sec^2(u) - 1)$.

Thus, the integral becomes $\int \tan(u)\sec^2(u)\,du - \int \tan(u)\,du$. The first integral is $\frac{\tan^2(u)}{2}$. The second is $-\ln|\cos(u)|$.

Combining results: $\frac{\tan^2(u)}{2} + \ln|\cos(u)| + C$.

Substituting back:

$$\frac{1}{2}\tan^2(\ln x) + \ln|\cos(\ln x)| + C$$

GLM 4.5 Air

Step 1: Substitution $u = \ln(x)$, $du = \frac{1}{x}dx$. Integral becomes $\int \tan^3(u)\,du$.

Step 2: Rewrite $\tan^3(u) = \tan(u)(\sec^2(u) - 1)$.

Step 3: Solve first integral $\int \tan(u)\sec^2(u)\,du = \frac{\tan^2(u)}{2}$.

Step 4: Solve second integral $\int \tan(u)\,du = -\ln|\cos(u)|$.

Step 5: Combine $\frac{\tan^2(u)}{2} + \ln|\cos(u)| + C$.

Final Answer

$$\int \frac{\tan^3(\ln(x))}{x}dx = \frac{\tan^2(\ln(x))}{2} - \ln|\sec(\ln(x))| + C$$

LongCat Flash Chat

Step 1: Substitution $u = \ln x$, $du = \frac{dx}{x}$. Integral becomes $\int \tan^3(u)\,du$.

Step 2: Integrate $\int \tan^3 u\,du = \int \tan u(\sec^2 u - 1)\,du$. $\int \tan u \sec^2 u\,du = \frac{\tan^2 u}{2}$. $\int \tan u\,du = -\ln|\cos u|$.

Result: $\frac{1}{2}\tan^2 u + \ln|\cos u| + C$.

Final Answer:

$$\frac{1}{2}\tan^2(\ln x) + \ln|\cos(\ln x)| + C$$

Deepseek R1T Chimera

Substitution $u = \ln(x)$, $du = dx/x$. Integral becomes $\int \tan^3(u)du$. Rewrite $\tan^3(u) = \tan(u)(\sec^2(u)-1)$. Integral is $\int \tan(u)\sec^2(u)du - \int \tan(u)du$. First part: $\frac{1}{2}\tan^2(u)$. Second part: $-\ln|\cos(u)|$. Result: $\frac{1}{2}\tan^2(u) + \ln|\cos(u)| + C$.

Substituted back: $\frac{1}{2}\tan^2(\ln(x)) + \ln|\cos(\ln(x))| + C$.

Answer:

$$\frac{1}{2}\tan^2(\ln(x)) + \ln|\cos(\ln(x))| + C$$

Tongyi DeepResearch 30B A3B

Substitution $u = \ln x \Rightarrow du = \frac{1}{x}dx$. Integral: $\int \tan^3(u)\,du = \int \tan(u)(\sec^2(u) - 1)\,du$. $\int \tan(u)\sec^2(u)\,du = \frac{1}{2}\tan^2(u)$. $\int \tan(u)\,du = -\ln|\cos(u)|$. Total: $\frac{1}{2}\tan^2(u) + \ln|\cos(u)| + C$.

Final Answer:

$$\frac{1}{2}\tan^2(\ln x) + \ln|\cos(\ln x)| + C$$

Grok 4.1 Fast

$$\frac{1}{2}\tan^2(\ln x) + \ln|\cos(\ln x)| + C$$

Explanation: Substitution $u = \ln x$. Integral $\int \tan^3(u)du$. Rewrite $\tan^3(u) = \tan(u)(\sec^2(u)-1)$. Integrate to get $\frac{1}{2}\tan^2(u) + \ln|\cos(u)|$. Substitute back.