

Basic antiderivative catalogue; first practice clinic

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Practice problems

1. Find the indefinite integral: $\int(6x^5 - \frac{3}{x} + 2e^x) dx$
2. Find the indefinite integral: $\int(\frac{1}{x^3} + \cos x + 5^x) dx$
3. Find the indefinite integral: $\int(\frac{2}{\sqrt{x}} - \sin x + \sec^2 x) dx$

Solutions

1. Find the indefinite integral: $\int(6x^5 - \frac{3}{x} + 2e^x) dx$

- Apply linearity to split the integral into three parts: $6 \int x^5 dx - 3 \int \frac{1}{x} dx + 2 \int e^x dx$.
- Use the power rule for the first term: $6 \frac{x^6}{6} = x^6$.
- Use the logarithm rule for the second term: $-3 \ln |x|$.
- Use the exponential rule for the third term: $2e^x$.
- Combine the results and add the constant of integration C .

Answer: $x^6 - 3\ln|x| + 2e^x + C$

2. Find the indefinite integral: $\int(\frac{1}{x^3} + \cos x + 5^x) dx$

- Rewrite the first term as a power: $\int(x^{-3} + \cos x + 5^x) dx$.
- Apply the power rule to x^{-3} : $\frac{x^{-2}}{-2} = -\frac{1}{2x^2}$.
- Apply the trig rule to $\cos x$: $\sin x$.
- Apply the general exponential rule to 5^x : $\frac{5^x}{\ln 5}$.
- Combine and add C .

Answer: $-\frac{1}{2x^2} + \sin x + \frac{5^x}{\ln 5} + C$

3. Find the indefinite integral: $\int(\frac{2}{\sqrt{x}} - \sin x + \sec^2 x) dx$

- Rewrite the first term as $2x^{-1/2}$.
- Integrate $2x^{-1/2}$ using the power rule: $2 \frac{x^{1/2}}{1/2} = 4\sqrt{x}$.
- Integrate $-\sin x$: the antiderivative of $\sin x$ is $-\cos x$, so $-\sin x$ becomes $-(-\cos x) = \cos x$.
- Integrate $\sec^2 x$: the antiderivative is $\tan x$.
- Combine and add C .

Answer: $4\sqrt{x} + \cos x + \tan x + C$