

Antiderivatives and the indefinite integral

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Practice problems

1. Find the indefinite integral: $\int (5x^4 - 6x + 2) dx$.
2. Find the indefinite integral: $\int (\frac{3}{x^2} + e^x) dx$.
3. Find the indefinite integral: $\int (x + 1)^2 dx$.

Solutions

1. Find the indefinite integral: $\int(5x^4 - 6x + 2) dx$.

- Apply linearity to split the integral into three parts: $5 \int x^4 dx - 6 \int x dx + 2 \int 1 dx$.
- Use the power rule on x^4 to get $x^5/5$, so $5(x^5/5) = x^5$.
- Use the power rule on x to get $x^2/2$, so $-6(x^2/2) = -3x^2$.
- The integral of the constant 2 is $2x$.
- Combine the terms and add the constant of integration C .

Answer: $x^5 - 3x^2 + 2x + C$

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

- Rewrite the first term using a negative exponent: $\int(3x^{-2} + e^x) dx$.
- Apply the power rule to $3x^{-2}$: the new exponent is -1 , and we divide by -1 , giving $3(x^{-1}/-1) = -3x^{-1}$.
- The antiderivative of e^x is e^x .
- Combine the results and add C .

Answer: $-3x^{-1} + e^x + C$

3. Find the indefinite integral: $\int(x + 1)^2 dx$.

- Expand the squared binomial first: $(x + 1)^2 = x^2 + 2x + 1$.
- Set up the integral of the expanded form: $\int(x^2 + 2x + 1) dx$.
- Integrate x^2 to get $x^3/3$.
- Integrate $2x$ to get x^2 .
- Integrate 1 to get x .
- Combine all terms and add C .

Answer: $\frac{1}{3}x^3 + x^2 + x + C$