

# Workbook



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# Integration by Substitution

## Integration by Substitution

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### Questions:

Compute the following integral:

1)  $\int \frac{-x}{x^2+4} dx$

2)  $\int x(2x^2+1)^5 dx$

3)  $\int \frac{(\ln x)^2}{x} dx$

4)  $\int e^{x^2+4} x dx$

5)  $\int \frac{e^x}{e^x+1} dx$

6)  $\int x\sqrt{x^2+1} dx$

7)  $\int \frac{x}{\sqrt{x^2+4}} dx$

8)  $\int x^3\sqrt{x^2+1} dx$

9)  $\int x^5\sqrt{x^2+1} dx$

10)  $\int \frac{x^3}{\sqrt{x^2+4}} dx$

11)  $\int \frac{x^5}{\sqrt{x^3+1}} dx$

12)  $\int \sqrt[4]{x^2+1} \cdot x^3 dx$

13)  $\int \frac{x^3}{\sqrt[3]{x^2+4}} dx$

14)  $\int \frac{1}{x(\ln x)^4} dx$

15)  $\int e^{x^2} x^3 dx$

16)  $\int \frac{x^7}{(1-x^4)^2} dx$

17)  $\int \sqrt{1+e^{2x}} dx$

18)  $\int \sqrt{1+\frac{1}{x^2}} dx$

19)  $\int e^{\sqrt{x}} dx$

20)  $\int e^{\sqrt[3]{x}} dx$

21)  $\int \frac{1}{\sqrt{x}+\sqrt[3]{x}} dx$

22)  $\int \arctan(\sqrt{x}) dx$

Answer Key:

1)  $-\frac{1}{2}\ln(x^2+4)+C$

2)  $\frac{1}{24}(2x^2+1)^6+C$

3)  $\frac{1}{3}(\ln x)^3+C$

4)  $\frac{1}{2}e^{x^2+4}+C$

5)  $\ln(e^x+1)+C$

6)  $\frac{1}{3}(x^2+1)^{\frac{3}{2}}+C$

7)  $\sqrt{x^2+4}+C$

8)  $\frac{1}{5}(x^2+1)^{\frac{5}{2}}-\frac{1}{3}(x^2+1)^{\frac{3}{2}}+C$

9)  $\frac{1}{2}(x^2+1)^{\frac{7}{2}}-\frac{2}{5}(x^2+1)^{\frac{5}{2}}+\frac{1}{3}(x^2+1)^{\frac{3}{2}}+C$

10)  $\frac{1}{3}(x^2+4)^{\frac{3}{2}}-4(x^2+4)^{\frac{1}{2}}+C$

11)  $(x^3+1)^{\frac{3}{2}}-\frac{2}{3}(x^3+1)^{\frac{1}{2}}+C$

12)  $\frac{2}{9}(x^2+1)^{\frac{9}{2}}-\frac{2}{5}(x^2+1)^{\frac{5}{2}}+C$

13)  $\frac{3}{10}(x^2+4)^{\frac{5}{3}}-3(x^2+4)^{\frac{2}{3}}+C$

14)  $\frac{-1}{3(\ln x)^3}+C$

15)  $\frac{1}{2}(x^2-1)e^{x^2}+C$

16)  $\frac{1}{4}\left(\frac{1}{1-x^4}+\ln(1-x^4)\right)+C$

17)  $\sqrt{1+e^{2x}}+\frac{1}{2}\ln\left|\frac{\sqrt{1+e^{2x}}-1}{\sqrt{1+e^{2x}}+1}\right|+C$

18)  $\sqrt{x^2+1}+\frac{1}{2}\ln\left|\frac{\sqrt{x^2+1}-1}{\sqrt{x^2+1}+1}\right|+C$

19)  $2(\sqrt{x}-1)e^{\sqrt{x}}+C$

20)  $3e^{\sqrt[3]{x}}\left(x^{\frac{2}{3}}-2x^{\frac{1}{3}}+2\right)+C$

21)  $6\left[\frac{\sqrt{x}}{3}-\frac{\sqrt{x}}{2}+\sqrt[6]{x}-\ln|\sqrt[6]{x}+1|\right]+C$

22)  $(x+1)\arctan(\sqrt{x})-\sqrt{x}+C$