ESERCITAZIONE di
MATEMATICA GENERALE - CLEF
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Calcolo Integrale

Es. 1 (Integrali Indefiniti Immediati)**.** Calcola i seguenti integrali.

(1) $\int x^2 + x + 10\,dx$

(2) $\int \frac{1}{x^3} + \frac{3}{x^2}\,dx$

(3) $\int 3\sqrt{x} - 6\sqrt[4]{x^3}\,dx$

(4) $\int \frac{x+2}{\sqrt{x}}\,dx$

(5) $\int \frac{1}{3x^2} - 2x^3 + \frac{1}{\sqrt[3]{x^2}}\,dx$

(6) $\int \frac{x^4+2x^2+2x-1}{3x}\,dx$

(7) $\int 4e^x + 5 \cdot 2^x\,dx$

(8) $\int e^{x-1} - \frac{e^{x^2-2x+5}}{e^{x^2-x}}\,dx$

(9) $\int e^x(1 - 2xe^{-x})\,dx$

(10) $\int 5e^x - \frac{1}{x}\,dx$

(11) $\int 2 - e^{x-2} - 5^x + \sqrt{x}\,dx$

(12) $\int \sqrt{3}\sin(x) - \cos(x)\,dx$

(13) $\int \frac{x\sin(x) - 3x\cos(x)}{2x}\,dx$

(14) $\int -\frac{2}{x^3} + \frac{\sin(x)-\cos(x)}{3}\,dx$

(15) $\int \frac{1}{\cos^2(x)}\,dx$

(16) $\int \tan^2(x)\,dx$

Es. 2 (Integrali Indefiniti - Funzioni Composte)**.** .

- $\int f' \cdot [f]^\alpha\,dx = \frac{[f]^{\alpha+1}}{\alpha+1} + \text{cost.}$
- $\int \frac{f'}{f}\,dx = \ln|f| + \text{cost.}$
- $\int f' \cdot e^f\,dx = e^f + \text{cost.}$

(1) $\int 2x(x^2-1)^3\,dx$

(2) $\int (3x-2)^4\,dx$

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

(4) $\int x\sqrt{x^2+1}\,dx$

(5) $\int \frac{x^2+1}{(x^3+3x)^3}\,dx$

(6) $\int e^{2x}\sqrt{5+e^{2x}}\,dx$

(7) $\int \frac{x^2+\ln^2(x)}{x}\,dx$

(8) $\int \frac{1}{2x+5}\,dx$

(9) $\int \frac{x^2}{x^3+2}\,dx$

(10) $\int \frac{x+1}{x-3}\,dx$

(11) $\int \frac{3x^2+4x+1}{x^3+2x^2+x}\,dx$

(12) $\int \frac{x}{x-10}\,dx$

(13) $\int \frac{8x^3}{x^4+1}\,dx$

(14) $\int \frac{\sin(x)}{\cos(x)+2}\,dx$

(15) $\int e^{-x} + 2\,dx$

(16) $\int e^{3x+1}\,dx$

(17) $\int xe^{-x^2}\,dx$

(18) $\int \frac{e^{\frac{1}{x}}}{x^2}\,dx$

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

(20) $\int (x^3-1)e^{-x^4+4x}\,dx$

(21) $\int \frac{e^{\sqrt{2x-1}}}{\sqrt{2x+1}}\,dx$

Es. 3. Calcola i seguenti integrali **per Sostituzione**.

1. $\int \frac{1+e^{\sqrt{x}}}{\sqrt{x}}\,dx \quad (t=\sqrt{x})$.
2. $\int \frac{e^x}{e^{2x}+1}\,dx \quad (t=e^x)$
3. $\int \sin^2(x)\cos^3(x)\,dx$ $(t=\sin(x))$
4. $\int \frac{\sin(x)}{\sqrt{1-\cos(x)}}\,dx$ $(t=1-\cos(x))$
5. $\int \frac{x}{\sqrt{x-1}}\,dx$ $(t=\sqrt{x-1})$
6. $\int \frac{1}{\sqrt[3]{1-x}}\,dx$
7. $\int \frac{1}{x-\sqrt{x}}\,dx$
8. $\int \frac{x+3}{\sqrt{x+2}}\,dx$
9. $\int \frac{e^x}{e^x-e^{-x}}\,dx$
10. $\int \frac{1}{\sqrt{x}+3}\,dx$

Es. 4. Calcola i seguenti integrali **per Parti:** $\int (f\cdot g')\,dx = f\cdot g - \int (f'\cdot g)\,dx$

1. $\int \ln(x)\,dx$
2. $\int x^2\,\ln(x)\,dx$
3. $\int xe^x\,dx$
4. $\int \frac{\ln(x)}{x^2}\,dx$
5. $\int \frac{\ln(x)}{2\sqrt{x}}\,dx$
6. $\int \ln^2(x)\,dx$
7. $\int \frac{x}{2\sqrt{x+1}}\,dx$
8. $\int 2x\,e^{2x}\,dx$
9. $\int \frac{\sin(x)}{e^x}\,dx$
10. $\int e^{2x+1}\sin(2x)\,dx$
11. $\int \frac{x}{\sqrt{1-x^2}}\ln(x)\,dx$

Es. 5. Calcola i seguenti Integrali Indefiniti.

(1) $\int \left(x^3+x^{-2}+x^{2/3}+\frac{1}{x}\right)dx$
(2) $\int \left(\frac{1}{\sqrt[2]{x^5}}+\frac{x^2+x^{\frac{1}{3}}}{x}\right)dx$
(3) $\int (x^{-1}+(1+x^2)^{-1})\,dx$
(4) $\int (x-1)^{-1}\,dx$
(5) $\int \left(\frac{x^2}{\sqrt{x}}-\frac{1}{x^2}+\sqrt[5]{x}+2\right)dx$
(6) $\int (2x-3)^3\,dx$
(7) $\int \sin(-x)\,dx$
(8) $\int 2x(x^2-7)^{-1}\,dx$
(9) $\int \frac{e^x}{e^x+1}\,dx$
(10) $\int \sqrt[4]{(3x-2)^3}\,dx$
(11) $\int xe^{-x^2}\,dx$
(12) $\int x^2\cos(x^3)\,dx$
(13) $\int \frac{1+x}{1+x^2}\,dx$
(14) $\int \frac{2x}{\sqrt{1+x^2}}\,dx$
(15) $\int \frac{1}{e^x+3}\,dx$
(16) $\int \cos^2(x)\,dx$
(17) $\int \frac{\ln^3(x)}{x}\,dx$
(18) $\int \frac{1}{x\ln^5(x)}\,dx$
(19) $\int \frac{1}{3}x^2e^{x^3}\,dx$
(20) $\int \frac{x^3}{1+x^8}\,dx$
(21) $\int (1+\cos^2(x))\,dx$
(22) $\int \frac{1+x}{x}\frac{1}{x+\ln(x)}\,dx$
(23) $\int e^{\ln(x)}dx$.

Es. 6. Calcola i seguenti Integrali Definiti.

(1) $\int_2^5 x+1\,dx = [27/2]$
(2) $\int_0^1 x^2+x\,dx = [5/6]$
(3) $\int_{-2}^{-1} 2e^x\,dx = [2e^{-2}(e-1)]$
(4) $\int_8^{27} \frac{e^{\sqrt[3]{x}}}{\sqrt[3]{x}}\,dx = 3(e^3-e^2)$
(5) $\int_1^4 5x\sqrt{x}-\frac{1}{x}\,dx = [62-\ln(4)]$
(6) $\int_{-2}^{-1} \frac{x^2+1}{x}\,dx = [-3/2-\ln(2)]$
(7) $\int_0^{\pi} \sin(2x)\,dx = [0]$
(8) $\int_0^1 4(x+1)^3\,dx = [15]$
(9) $\int_{-3}^0 2x^2+5\,dx = [33]$
(10) $\int_0^{\frac{\pi}{2}} \sin(x)+\cos(x)\,dx = [2]$
(11) $\int_0^2 e^x\sqrt{e^x+1}\,dx = [\frac{2}{3}(\sqrt{(e^2+1)^3}-\sqrt{8})]$
(12) $\int_0^1 \frac{x^2}{x^3+1}\,dx = \frac{1}{3}\ln(2)$
(13) $\int_1^3 \frac{4x+3}{2x^2+3x}\,dx = \ln(27)-\ln(5)$
(14) $\int_0^{\frac{\pi}{2}} \frac{\cos(x)}{(\sin(x)+1)^2}\,dx = \frac{1}{2}$