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Integrales de Funciones Algebraicas

Sección ✳1 Resueltas de Forma Directa

✳1 ----------

$$\int x^6\,dx = \frac{x^{6+1}}{6+1} + C = \frac{x^7}{7} + C$$

✳2 ----------

$$\int 5x^4\,dx = 5\int x^4 dx = \frac{5\,x^{4+1}}{4+1} + C = \frac{5\,x^5}{5} + C = x^5 + C$$

✳3 ----------

$$\int bx^3\,dx = b\int x^3 dx = \frac{b\,x^{3+1}}{3+1} + C = \frac{b\,x^4}{4} + C$$

✳4 ----------

$$\int \sqrt{3}x^2\,dx = \sqrt{3}\int x^2 dx = \frac{\sqrt{3}x^{2+1}}{2+1} + C = \frac{\sqrt{3}x^3}{3} + C$$

✳5 ----------

$$\int a\,dx = a\int dx = ax + C$$

✳6 ----------

$$\int \frac{3dx}{4} = \frac{3}{4}\int dx = \frac{3}{4}x + C$$

✳7 ----------

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$$\int \frac{dx}{3} = \frac{1}{3}\int dx = \frac{1}{3}x + C$$

✳8 ----------

$$\int \sqrt[3]{x} = \int x^{\frac{1}{3}}\,dx = \frac{x^{\frac{1}{3}+1}}{\frac{1}{3}+1} + C = \frac{x^{\frac{4}{3}}}{\frac{4}{3}} + C = \frac{3}{4}\sqrt[3]{x^4} + C$$

✳9 ----------

$$\int 5\sqrt[4]{x} = 5\int x^{\frac{1}{4}}\,dx = \frac{5x^{\frac{1}{4}+1}}{\frac{1}{4}+1} + C = \frac{5x^{\frac{5}{4}}}{\frac{5}{4}} + C = 4\sqrt[4]{x^5} + C$$

✳10 ----------

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$$\int \frac{dx}{x^3} = \int x^{-3}\,dx = \frac{x^{-3+1}}{-3+1} + C = \frac{x^{-2}}{-2} + C = -\frac{1}{2x^2} + C$$

✳11 ----------

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$$\int \frac{5dx}{x^4} = 5\int x^{-4}\,dx = \frac{5x^{-4+1}}{-4+1} + C = \frac{5x^{-3}}{-3} + C = -\frac{5}{3x^3} + C$$

✳12 ----------

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$$\int \frac{4dx}{x} = 4\int \frac{dx}{x} = 4\ln x + C$$

✳13 ----------

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$$\int \frac{dx}{\sqrt[4]{x}} = \int x^{-\frac{1}{4}}\,dx = \frac{x^{-\frac{1}{4}+1}}{-\frac{1}{4}+1} + C = \frac{x^{\frac{3}{4}}}{\frac{3}{4}} + C = \frac{4}{3}x^{\frac{3}{4}} + C = \frac{4}{3}\sqrt[4]{x^3} + C$$

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✳14 ----------

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$$\int \frac{6dx}{\sqrt[3]{x}} = 6\int x^{-\frac{1}{3}}\,dx = \frac{6x^{-\frac{1}{3}+1}}{-\frac{1}{3}+1} + C = \frac{6x^{\frac{2}{3}}}{\frac{2}{3}} + C = \frac{18}{2}x^{\frac{2}{3}} + C = 9\sqrt[3]{x^2} + C$$

✳15 ----------

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$$\int \sqrt[5]{x^3}\,dx = \int x^{\frac{3}{5}}\,dx = \frac{x^{\frac{3}{5}+1}}{\frac{3}{5}+1} + C = \frac{x^{\frac{8}{5}}}{\frac{8}{5}} + C = \frac{5}{8}x^{\frac{8}{5}} + C = \frac{5}{8}\sqrt[5]{x^8} + C$$

✳16 ----------

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$$\int \frac{a\,dx}{\sqrt[3]{x^2}} = a\int \frac{dx}{x^{\frac{2}{3}}} = a\int x^{-\frac{2}{3}}\,dx = \frac{ax^{-\frac{2}{3}+1}}{-\frac{2}{3}+1} + C = \frac{ax^{\frac{1}{3}}}{\frac{1}{3}} + C = 3a\sqrt[3]{x} + C$$

✳17 ----------

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$$\int \frac{5dx}{2x} = \frac{5}{2}\int \frac{dx}{x} = \frac{5}{2}In|x| + C$$

✳18 ----------

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$$\int \sqrt{bx}\,dx = \sqrt{b}\int x^{\frac{1}{2}}dx = \frac{\sqrt{b}x^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C = \frac{\sqrt{b}x^{\frac{3}{2}}}{\frac{3}{2}} + C = \frac{2\sqrt{b}}{3}\sqrt{x^3} + C = \frac{2}{3}\sqrt{bx^3} + C$$

✳19 ----------

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$$\int \left(\frac{5}{\sqrt[3]{x}} - 4\sqrt[3]{x}\right)dx = 5\int x^{-\frac{1}{3}}dx - 4\int x^{\frac{1}{3}}\,dx = \frac{5x^{-\frac{1}{3}+1}}{-\frac{1}{3}+1} - \frac{4x^{\frac{1}{3}+1}}{\frac{1}{3}+1} + C = \frac{5x^{\frac{2}{3}}}{\frac{2}{3}} - \frac{4x^{\frac{4}{3}}}{\frac{4}{3}} + C = \frac{15}{2}\sqrt[3]{x^2} - 3\sqrt[3]{x^4} + C$$

✳20 ----------

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$$\int \left(\frac{3}{x^5}-\frac{2}{x^2}-\frac{6}{x}\right]dx \ = 3\int x^{-5}dx - 2\int x^{-2}\,dx - 6\int x^{-1}\,dx = \frac{3x^{-5+1}}{-5+1} - \frac{2x^{-2+1}}{-2+1} - 6\,In\,x + C$$

$$= \frac{3x^{-4}}{-4} - \frac{2x^{-1}}{-1} - 6\,In\,x + C = -\frac{3}{4x^4} + \frac{2}{x} - 6\,In\ x + C$$

✳21 ----------

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$$\int \sqrt[3]{at}\,dt = \sqrt[3]{a}\int t^{\frac{1}{3}}dt = \frac{\sqrt[3]{a}\cdot t^{\frac{1}{3}+1}}{\frac{1}{3}+1} + C = \frac{\sqrt[3]{a}\cdot t^{\frac{4}{3}}}{\frac{4}{3}} + C = \frac{3}{4}\sqrt[3]{a}\sqrt[3]{t^4} + C = \frac{3}{4}\sqrt[3]{at^4} + C$$

✳22 ----------

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$$\int \sqrt{6t}\,dt = \sqrt{6}\int t^{\frac{1}{2}}\,dt = \frac{\sqrt{6}\cdot t^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C = \frac{\sqrt{6}\cdot t^{\frac{3}{2}}}{\frac{3}{2}} + C = \frac{2}{3}\sqrt{6}\sqrt{t^3} + C = \frac{2}{3}\sqrt{6t^3} + C$$

✳23 ----------

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$$\int (8x^5 - 5x^4 - 9x^3 - 6x^2 - 2x - 3)\,dx = 8\int x^5dx - 5\int x^4\,dx - 9\int x^3\,dx - 6\int x^2\,dx - 2\int x\,dx - 3\int dx$$

$$= \frac{8x^{5+1}}{5+1} - \frac{5x^{4+1}}{4+1} - \frac{9x^{3+1}}{3+1} - \frac{6x^{2+1}}{2+1} - \frac{2x^{1+1}}{1+1} - 3x + C$$

$$= \frac{8x^6}{6} - \frac{5x^5}{5} - \frac{9x^4}{4} - \frac{6x^3}{3} - \frac{2x^2}{2} - 3x + C$$

$$= \frac{4}{3}x^6 - x^5 - \frac{9}{4}x^4 - 2x^3 - x^2 - 3x + C$$

✳24 ----------

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$$\int (ax^3 - bx^2 - cx + d)dx = a\int x^3dx - b\int x^2dx - c\int x\,dx\;\; d\int dx = \frac{ax^{3+1}}{3+1} - \frac{bx^{2+1}}{2+1} - \frac{cx^2}{2} + \; dx + C$$

$$= \frac{ax^4}{4} - \frac{bx^3}{3} - \frac{cx^2}{2} + \; dx + C$$

✳25 ----------

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$$\int \left(\frac{x^2}{\sqrt{a^2+b^2}} - \frac{3x}{\sqrt{a}} - 5\sqrt{b}\right)dx = \frac{1}{\sqrt{a^2+b^2}}\int x^2dx - \frac{3}{\sqrt{a}}\int x\,dx - 5\sqrt{b}\int dx$$

$$= \frac{1}{\sqrt{a^2+b^2}}\cdot\frac{x^3}{3} - \frac{3}{\sqrt{a}}\cdot\frac{x^2}{2} - 5\sqrt{b}\,x + C = \frac{x^3}{3\sqrt{a^2+b^2}} - \frac{3x^2}{2\sqrt{a}} - 5\sqrt{b}x + C$$

✳26 ----------

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$$\int \left(\frac{x^4 - 6x^3 - 7x}{x}\right)dx = \int \frac{x^4}{x}dx - 6\int \frac{x^3}{x}dx - 7\int \frac{x}{x}dx =$$

$$= \int x^3\,dx - 6\int x^2dx - 7\int dx = \frac{x^{3+1}}{3+1} - \frac{6x^{2+1}}{2+1} - 7x + C = \frac{x^4}{4} - 2\,x^3 - 7x + C$$

✳27 ----------

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$$\int \left(\frac{3}{\sqrt[5]{x^2}} - \frac{2}{\sqrt[5]{x}}\right)dx = 3\int x^{-\frac{2}{5}}dx - 2\int x^{-\frac{1}{5}}dx = \frac{3x^{-\frac{2}{5}+1}}{-\frac{2}{5}+1} - \frac{2x^{-\frac{1}{5}+1}}{-\frac{1}{5}+1} + \; C = \frac{3x^{\frac{3}{5}}}{\frac{3}{5}} - \frac{2x^{\frac{4}{5}}}{\frac{4}{5}} + \; C$$

$$= 5x^{\frac{3}{5}} - \frac{5}{2}x^{\frac{4}{5}} \;\; = \;\; 5\sqrt[5]{x^3} - \frac{5}{2}\sqrt[5]{x^4} + \; C$$

✳28 ----------

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$$\int\left(\frac{4}{\sqrt[3]{x}}-\frac{5}{\sqrt[4]{x}}\right)dx=4\int x^{-\frac{1}{3}}dx-5\int x^{-\frac{1}{4}}dx=\frac{4x^{-\frac{1}{3}+1}}{-\frac{1}{3}+1}-\frac{5x^{-\frac{1}{4}+1}}{-\frac{1}{4}+1}+C=\frac{4x^{\frac{2}{3}}}{\frac{2}{3}}-\frac{5x^{\frac{3}{4}}}{\frac{3}{4}}+C$$

$$=6x^{\frac{2}{3}}-\frac{20}{3}x^{\frac{3}{4}}+C=6\sqrt[3]{x^2}-\frac{20}{3}\sqrt[4]{x^3}+C$$

✳29 ----------

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$$\int\left(y^{\frac{5}{2}}-5y^{\frac{4}{3}}-2y^{\frac{1}{4}}-\sqrt{y}\right)dy=\int y^{\frac{5}{2}}dy-5\int y^{\frac{4}{3}}dy-\int y^{\frac{1}{2}}dy=\frac{y^{\frac{5}{2}+1}}{\frac{5}{2}+1}-\frac{5y^{\frac{4}{3}+1}}{\frac{4}{3}+1}-\frac{y^{\frac{1}{2}+1}}{\frac{1}{2}+1}+C$$

$$=\frac{y^{\frac{7}{2}}}{\frac{7}{2}}-\frac{5y^{\frac{7}{3}}}{\frac{7}{3}}-\frac{y^{\frac{3}{2}}}{\frac{3}{2}}+C=\frac{2}{7}y^{\frac{7}{2}}-\frac{15}{7}y^{\frac{7}{3}}-\frac{2}{3}y^{\frac{3}{2}}+C=\frac{2}{7}\sqrt{y^7}-\frac{15}{7}\sqrt[3]{y^7}-\frac{2}{3}\sqrt{y^3}+C$$

✳30 ----------

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$$\int\left(\frac{y^{\frac{7}{2}}-y^{\frac{5}{3}}-y^{\frac{1}{4}}}{y^2}\right)dy=\int\frac{y^{\frac{7}{2}}}{y^2}dy-\int\frac{y^{\frac{5}{3}}}{y^2}dy-\int\frac{y^{\frac{1}{4}}}{y^2}dy=\int y^{\frac{7}{2}-2}dy-\int y^{\frac{5}{3}-2}dy-\int y^{\frac{1}{4}-2}dy$$

$$=\frac{y^{\frac{7}{2}-1}}{\frac{7}{2}-1}-\frac{y^{\frac{5}{3}-1}}{\frac{5}{3}-1}-\frac{y^{\frac{1}{4}-1}}{\frac{1}{4}-1}+C=\frac{y^{\frac{5}{2}}}{\frac{5}{2}}-\frac{y^{\frac{2}{3}}}{\frac{2}{3}}-\frac{y^{-\frac{3}{4}}}{-\frac{3}{4}}+C=\frac{2}{5}y^{\frac{5}{2}}-\frac{3}{2}y^{\frac{2}{3}}+\frac{4}{3}y^{-\frac{3}{4}}+C$$

$$=\frac{2}{5}\sqrt{y^5}-\frac{3}{2}\sqrt[3]{y^2}+\frac{4}{3\sqrt[4]{y^3}}+C$$

✳31 ----------

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$$\int\sqrt[3]{t}(5t^2-3t+2)dt=\int\left(5t^{\frac{1}{3}+2}-3t^{\frac{1}{3}+1}+2t^{\frac{1}{3}}\right)dt=5\int t^{\frac{1}{3}+2}dt-3\int t^{\frac{1}{3}+1}dt+2\int t^{\frac{1}{3}}dt$$

$$=\frac{5t^{\frac{1}{3}+3}}{\frac{1}{3}+3}-\frac{3t^{\frac{1}{3}+2}}{\frac{1}{3}+2}+\frac{2t^{\frac{1}{3}+1}}{\frac{1}{3}+1}+C=\frac{5t^{\frac{10}{3}}}{\frac{10}{3}}-\frac{3t^{\frac{7}{3}}}{\frac{7}{3}}+\frac{2t^{\frac{4}{3}}}{\frac{4}{3}}+C=\frac{15t^{\frac{10}{3}}}{10}-\frac{9t^{\frac{7}{3}}}{7}+\frac{6t^{\frac{4}{3}}}{4}+C=\frac{3}{2}\sqrt[3]{t^{10}}-\frac{9}{7}\sqrt[3]{t^7}+\frac{3}{2}\sqrt[3]{t^4}+C$$

✳32 ----------

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$$\int \sqrt[3]{7t}\,dt = \sqrt[3]{7}\int t^{\frac{1}{3}}\,dt = \frac{\sqrt[3]{7}t^{\frac{1}{3}+1}}{\frac{1}{3}+1} + C = \frac{\sqrt[3]{7}t^{\frac{4}{3}}}{\frac{4}{3}} + C = \frac{3\sqrt[3]{7t^4}}{4} + C$$

✳33 ----------

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$$\int (3x+4)^6\,dx = \frac{1}{3}\int 3(3x+4)^6\,dx = \frac{1}{3}\int u^6\,du = \frac{1}{3}\cdot\frac{u^{6+1}}{6+1} + C = \frac{1}{21}u^7 + C = \frac{1}{21}(3x+4)^7$$

$u = 3x+4$
$du = 3dx$

✳34 ----------

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$$\int (ax^2-b)^5\,x\,dx = \frac{1}{2a}\int (ax^2-b)^5\,2ax\;\,dx = \frac{1}{2a}\int u^5\,du = \frac{1}{2a}\cdot\frac{u^{5+1}}{5+1} + C = \frac{1}{12a}u^6 + C = \frac{1}{12a}(ax^2-b)^6 + C$$

$u = ax^2 - b$
$du = 2ax\,dx$

✳35 ----------

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$$\int t^2(t^3-4)^2\,dt = \frac{1}{3}\int 3t^2(t^3-4)^2\,dt = \frac{1}{3}\int u^2 du = \frac{1}{3}\cdot\frac{u^{2+1}}{2+1} + C = \frac{u^3}{9} + C = \frac{(t^3-4)^3}{9} + C$$

$u = t^3 - 4$
$du = 3t^2 dt$

✳36 ----------

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$$\int (a-by)^4\,dy = -\frac{1}{b}\int -(a-by)^4\,b\,dy = -\frac{1}{b}\int u^4\,du = -\frac{1}{b}\cdot\frac{u^{4+1}}{4+1} + C = -\frac{u^5}{5b} + C = -\frac{(a-by)^5}{5b} + C$$

$u = a - by$
$du = -bdy$

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✳37 ----------

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$$\int (t^2-6)^2\,dt = \int (t^4-12t^2+36)\,dt = \int t^4dt - 12\int t^2dt + 36\int dt$$

$$= \frac{t^{4+1}}{4+1} - \frac{12\,t^{2+1}}{2+1} + 36t + C = \frac{t^5}{5} - 4t^3 + 36t + C$$

✳38 ----------

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$$\int x\,(x+4)^2dx = \int x(x^2+8x+16)\,dx = \int (x^3+8x^2+16x)\,dx = \frac{x^{3+1}}{3+1} + \frac{8\,x^{2+1}}{2+1} + \frac{16x^2}{2} + C$$

✳39 ----------

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$$\int x^2(x+1)^3\,dx = \int x^2(x^3+3x^2+3x+1)\,dx = \int (x^5+3x^4+3x^3+x^2)\,dx$$

$$= \frac{x^{5+1}}{5+1} + \frac{3\,x^{4+1}}{4+1} + \frac{3\,x^{3+1}}{3+1} + \frac{x^{2+1}}{2+1} + C$$

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