Formulario matemáticas
Versión 3.0

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Índice

1 Exponentes

$$a^0 = 1 \quad (1)$$
$$a^1 = a \quad (2)$$
$$a^m a^n = a^{m+n} \quad (3)$$
$$(a^m)^n = a^{mn} \quad (4)$$
$$(ab)^n = a^n b^n \quad (5)$$
$$\frac{1}{a^n} = a^{-n} \quad (6)$$
$$\frac{a^m}{a^n} = a^{m-n} \quad (7)$$
$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \quad (8)$$

2 Radicales

$$\sqrt[n]{ab} = \sqrt[n]{a}\,\sqrt[n]{b} \quad (9)$$
$$\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} \quad (10)$$
$$\sqrt[n]{a} = a^{\frac{1}{n}} \quad (11)$$
$$\sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m = a^{\frac{m}{n}} \quad (12)$$
$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}} = \left(\frac{a}{b}\right)^{\frac{1}{n}} = \frac{a^{\frac{1}{n}}}{b^{\frac{1}{n}}} \quad (13)$$
$$a\sqrt[n]{d} + b\sqrt[n]{d} - c\sqrt[n]{d} = (a+b-c)\sqrt[n]{d} \quad (14)$$
$$\sqrt[m]{a}\cdot\sqrt[n]{b} = \sqrt[m\cdot n]{a^n}\cdot\sqrt[n\cdot m]{b^m} \quad (15)$$
$$\frac{\sqrt[n]{a^m}}{c} = \frac{a}{c\cdot\sqrt[n]{a^{n-m}}} \quad (16)$$
$$\frac{a}{\sqrt[n]{b^m}} = \frac{a\cdot\sqrt[n]{b^{n-m}}}{b} \quad (17)$$
$$a^m\cdot\sqrt[n]{b} = \sqrt[n]{(a^m)^n\cdot b} \quad (18)$$

3 Productos notables

$$(x+y)^2 = x^2+2xy+y^2 \quad (19)$$
$$(x-y)^2 = x^2-2xy+y^2 \quad (20)$$
$$(a+b+c)^2 = a^2+b^2+c^2+2ab+2ac+2bc \quad (21)$$
$$(x+y)^3 = x^3+3x^2y+3xy^2+y^3 \quad (22)$$
$$(x-y)^3 = x^3-3x^2y+3xy^2-y^3 \quad (23)$$
$$(x+y)^4 = x^4+4x^3y+6x^2y^2+4xy^3+y^4 \quad (24)$$
$$(x-y)^4 = x^4-4x^3y+6x^2y^2-4xy^3+y^4 \quad (25)$$

4 Factores notables

$$x^2-y^2 = (x+y)(x-y) \quad (26)$$
$$x^3-y^3 = (x-y)(x^2+xy+y^2) \quad (27)$$
$$x^3+y^3 = (x+y)(x^2-xy+y^2) \quad (28)$$
$$x^4-y^4 = (x+y)(x-y)(x^2+y^2) \quad (29)$$
$$x^5-y^5 = (x-y)(x^4+x^3y+x^2y^2+xy^3+y^4) \quad (30)$$
$$x^5+y^5 = (x+y)(x^4-x^3y+x^2y^2-xy^3+y^4) \quad (31)$$

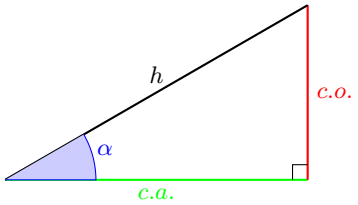
5 Factores notables especiales

$$a^2+2ab+b^2 = (a+b)^2 \quad (32)$$
$$a^2-2ab+b^2 = (a-b)^2 \quad (33)$$
$$am+bm+a^2+ab = (a+b)(m+a) \quad (34)$$
$$x^2+(a+b)x+ab = (x+a)(x+b) \quad (35)$$
$$m^2+2mn+n^2-p^2 = (m+n-p)(m+n+p) \quad (36)$$
$$\frac{a\pm b}{c} = \frac{a^2-b^2}{c\cdot(a\mp b)} \quad (37)$$
$$\sqrt[3]{a}-\sqrt[3]{b} = \frac{a-b}{a^{\frac{2}{3}}+a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}}} \quad (38)$$
$$\sqrt[3]{a}+\sqrt[3]{b} = \frac{a+b}{a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}}} \quad (39)$$

6 Leyes de los logarítmos

$$x = b^y \quad (40)$$
$$y = \log_b x \quad (41)$$
$$\log_b 1 = 0 \quad (42)$$
$$\log_b b = 1 \quad (43)$$
$$\log_b(u\cdot v) = \log_b(u)+\log_b(v) \quad (44)$$
$$\log_b\left(\frac{u}{v}\right) = \log_b(u)-\log_b(v) \quad (45)$$
$$\log_b(u^n) = n\cdot\log_b(u) \quad (46)$$

7 Trigonometría



$$\sin(\alpha) = \frac{c.o.}{h} = \frac{1}{\csc(\alpha)} \quad (47)$$
$$\cos(\alpha) = \frac{c.a.}{h} = \frac{1}{\sec(\alpha)} \quad (48)$$
$$\tan(\alpha) = \frac{c.o.}{c.a.} = \frac{1}{\cot(\alpha)} \quad (49)$$
$$\cot(\alpha) = \frac{c.a.}{c.o.} = \frac{1}{\tan(\alpha)} \quad (50)$$
$$\sec(\alpha) = \frac{h}{c.a.} = \frac{1}{\cos(\alpha)} \quad (51)$$
$$\csc(\alpha) = \frac{h}{c.o.} = \frac{1}{\sin(\alpha)} \quad (52)$$
$$\tan(\alpha) = \frac{\sin(\alpha)}{\cos(\alpha)} \quad (53)$$
$$\cot(\alpha) = \frac{\cos(\alpha)}{\sin(\alpha)} \quad (54)$$

8 Recíprocas

$$\sin(\alpha)\csc(\alpha) = 1 \quad (55)$$
$$\cos(\alpha)\sec(\alpha) = 1 \quad (56)$$
$$\tan(\alpha)\cot(\alpha) = 1 \quad (57)$$

9 Identidades Pitagóricas

$$\sin^2(\alpha)+\cos^2(\alpha) = 1 \quad (58)$$
$$\sec^2(\alpha)-\tan^2(\alpha) = 1 \quad (59)$$
$$\csc^2(\alpha)-\cot^2(\alpha) = 1 \quad (60)$$

10 Suma y resta de ángulos

$$\sin(a+b) = \sin(a)\cos(b)+\cos(a)\sin(b) \quad (61)$$
$$\sin(a-b) = \sin(a)\cos(b)-\cos(a)\sin(b) \quad (62)$$
$$\cos(a+b) = \cos(a)\cos(b)-\sin(a)\sin(b) \quad (63)$$
$$\cos(a-b) = \cos(a)\cos(b)+\sin(a)\sin(b) \quad (64)$$
$$\tan(a+b) = \frac{\tan(a)+\tan(b)}{1-\tan(a)\tan(b)} \quad (65)$$
$$\tan(a-b) = \frac{\tan(a)-\tan(b)}{1+\tan(a)\tan(b)} \quad (66)$$
$$\cot(a+b) = \frac{\cot(a)\cot(b)-1}{\cot(a)+\cot(b)} \quad (67)$$
$$\cot(a-b) = \frac{\cot(a)\cot(b)+1}{\cot(a)-\cot(b)} \quad (68)$$

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11 Doble ángulo

$$\sin(2\alpha) = 2\sin(\alpha)\cos(\alpha) \quad (69)$$
$$\cos(2\alpha) = \cos^2(\alpha) - \sin^2(\alpha) \quad (70)$$
$$\tan(2\alpha) = \frac{2\tan(\alpha)}{1-\tan^2(\alpha)} \quad (71)$$

12 Mitad de un ángulo

$$\sin(\frac{1}{2}) = \sqrt{\frac{1-\cos(\alpha)}{2}} \quad (72)$$
$$\cos(\frac{1}{2}) = \sqrt{\frac{1+\cos(\alpha)}{2}} \quad (73)$$
$$\tan(\frac{1}{2}) = \sqrt{\frac{1-\cos(\alpha)}{1+\cos(\alpha)}} = \frac{\sin(\alpha)}{1+\cos(\alpha)} \quad (74)$$

13 Múltiplo de un ángulo

$$\sin(3\alpha) = 3\sin(\alpha) - 4\sin^3(\alpha) \quad (75)$$
$$\cos(3\alpha) = 4\cos^3(\alpha) - 3\cos(\alpha) \quad (76)$$
$$\tan(3\alpha) = \frac{3\tan(\alpha) - \tan^3(\alpha)}{1-3\tan^2(\alpha)} \quad (77)$$

14 Potencias de las funciones trigonométricas

$$\sin(\alpha)\cos(\alpha) = \frac{1}{2}\sin(2\alpha) \quad (78)$$
$$\sin^2(\alpha) = \frac{1}{2} - \frac{1}{2}\cos(2\alpha) \quad (79)$$
$$\cos^2(\alpha) = \frac{1}{2} + \frac{1}{2}\cos(2\alpha) \quad (80)$$
$$\sin^3(\alpha) = \frac{3}{4}\sin(\alpha) - \frac{1}{4}\sin(3\alpha) \quad (81)$$
$$\cos^3(\alpha) = \frac{3}{4}\cos(\alpha) + \frac{1}{4}\cos(3\alpha) \quad (82)$$

15 Paridad

$$\sin(-\alpha) = -\sin(\alpha) \quad (83)$$
$$\cos(-\alpha) = \cos(\alpha) \quad (84)$$
$$\tan(-\alpha) = -\tan(\alpha) \quad (85)$$
$$\cot(-\alpha) = -\cot(\alpha) \quad (86)$$
$$\sec(-\alpha) = \sec(\alpha) \quad (87)$$
$$\csc(-\alpha) = -\csc(\alpha) \quad (88)$$

16 Algunas fórmulas de reducción

$$\sin\left(\frac{\pi}{2} - x\right) = \cos(x) \quad (89)$$
$$\sin\left(\frac{\pi}{2} + x\right) = \cos(x) \quad (90)$$
$$\sin(\pi - x) = \sin(x) \quad (91)$$
$$\cos\left(\frac{\pi}{2} - x\right) = \sin(x) \quad (92)$$
$$\cos\left(\frac{\pi}{2} + x\right) = -\sin(x) \quad (93)$$
$$\cos(\pi - x) = -\cos(x) \quad (94)$$
$$\tan\left(\frac{\pi}{2} - x\right) = \cot(x) \quad (95)$$
$$\tan\left(\frac{\pi}{2} + x\right) = -\cot(x) \quad (96)$$
$$\tan(\pi - x) = -\tan(x) \quad (97)$$

17 Tabla radianes-grados

π rad	grados	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
0	$0°$	0	1	0
$\frac{\pi}{6}$	$30°$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
$\frac{\pi}{4}$	$45°$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$	$60°$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	$90°$	1	0	indefinido
π	$180°$	0	-1	0
$\frac{3\pi}{2}$	$270°$	-1	0	indefinido

18 Relación entre lados y ángulos

18.1. Ley de Senos

$$\frac{a}{\sin a} = \frac{b}{\sin b} = \frac{c}{\sin c} \quad (98)$$

18.2. Ley de Cosenos

$$c^2 = a^2 + b^2 - 2ab\cos c \quad (99)$$

18.3. Ley de Tangentes

$$\frac{a+b}{a-b} = \frac{\tan\frac{1}{2}(a+b)}{\tan\frac{1}{2}(a-b)} \quad (100)$$

19 Geometría analítica

19.1. Distancia entre dos puntos

$$d = \sqrt{(y_2-y_1)^2 + (x_2-x_1)^2} \quad (101)$$

19.2. Punto medio

$$x = \frac{x_1+x_2}{2} \qquad y = \frac{y_1+y_2}{2} \quad (102)$$

19.3. División de un segmento en una razón dada

$$x = \frac{x_1+rx_2}{1+r} \qquad y = \frac{y_1+ry_2}{1+r} \quad (103)$$

19.4. Área de un triángulo

$$A = \frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{vmatrix} = \frac{1}{2}|x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)| \quad (104)$$

20 Ecuación de una recta

20.1. Pendiente

$$m = \frac{y_2 - y_1}{x_2 - x_1} \tag{105}$$

20.2. Forma de los dos puntos

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) \tag{106}$$

20.3. Forma punto pendiente

$$y - y_1 = m(x - x_1) \tag{107}$$

20.4. Forma simétrica

$$\frac{x}{a} + \frac{y}{b} = 1 \tag{108}$$

20.5. Forma pendiente-intercepción

$$y = mx + b \tag{109}$$

20.6. Forma general

$$Ax + By + C = 0 \tag{110}$$

20.7. Transformación general a ordinaria

$$y = -\frac{A}{B}x - \frac{C}{B} \tag{111}$$

20.8. Transformación general a simétrica

$$\frac{x}{-\frac{C}{A}} + \frac{y}{-\frac{C}{B}} = 1 \tag{112}$$

20.9. Forma normal

$$x\cos(\theta) + y\sin(\theta - p) = 0 \tag{113}$$

20.10. Ángulo entre dos rectas

$$\tan(\alpha) = \frac{m_2 - m_1}{1 + m_1 m_2} \tag{114}$$

21 Circunferencia

21.1. Ecuación ordinaria

$$(x-h)^2 + (y-k)^2 = r^2 \tag{115}$$

21.2. Ecuación general

$$Ax^2 + Cy^2 + Dx + Ey + F = 0; \quad A = C \tag{116}$$

21.3. Ecuación canónica

$$x^2 + y^2 = r^2 \tag{117}$$

21.4. Transformación general a ordinaria

$$\left(x + \frac{D}{2A}\right)^2 + \left(y + \frac{E}{2A}\right)^2 = \frac{D^2 + E^2 - 4AF}{4A^2} \tag{118}$$

$$Centro = \left(-\frac{D}{2A}, -\frac{E}{2A}\right) \tag{119}$$

$$radio = \frac{1}{2A}\sqrt{D^2 + E^2 - 4AF} \tag{120}$$

22 Parábola

22.1. Horizontal

$$(y-k)^2 = 4p(x-h) \tag{121}$$

$$Cy^2 + Dx + Ey + F = 0 \tag{122}$$

$$V(h,\ k) \tag{123}$$

$$F(h+p,\ k) \tag{124}$$

$$x = h - p \tag{125}$$

$$LR = |4p| \tag{126}$$

22.2. Vertical

$$(x-h)^2 = 4p(y-k) \tag{127}$$

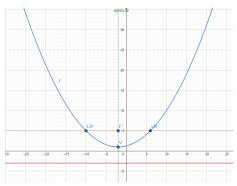
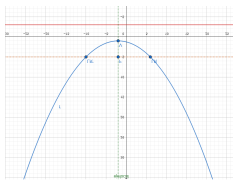
$$Ax^2 + Dx + Ey + F = 0 \tag{128}$$

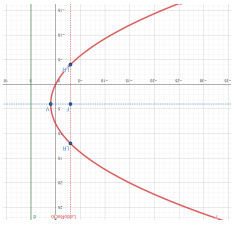
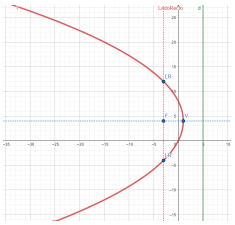
$$V(h,\ k) \tag{129}$$

$$F(h,\ k+p) \tag{130}$$

$$y = k - p \tag{131}$$

$$LR = |4p| \tag{132}$$

ECUACIÓN	GRÁFICA
$x^2 = 4Py$	
$x^2 = -4Py$	

ECUACIÓN	GRÁFICA
$y^2 = 4Px$	
$y^2 = -4Px$	

23 Elipse

23.1. Ecuación general

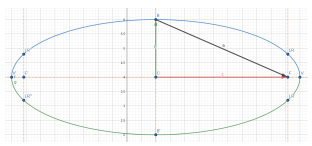
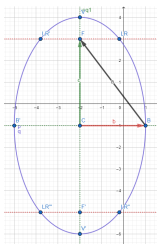
$$Ax^2 + Cy^2 + Dx + Ey + F = 0 \tag{133}$$
$$a^2 = b^2 + c^2;\ a > b \tag{134}$$
$$e = \frac{c}{a} \tag{135}$$

23.2. Horizontal

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1 \tag{136}$$
$$V_1V_2 = 2a \quad eje\ mayor \tag{137}$$
$$F_1F_2 = 2c \quad eje\ focal \tag{138}$$
$$B_1B_2 = 2b \quad eje\ menor \tag{139}$$
$$LR = \frac{2b^2}{a} \tag{140}$$
$$V\left(h \pm a,\ k\right) \tag{141}$$
$$F\left(h \pm c,\ k\right) \tag{142}$$
$$B\left(h,\ k \pm b\right) \tag{143}$$

23.3. Vertical

$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1 \tag{144}$$
$$V\left(h,\ k \pm a\right) \tag{145}$$
$$F\left(h,\ k \pm c\right) \tag{146}$$
$$B\left(h \pm b,\ k\right) \tag{147}$$

ECUACIÓN	GRÁFICA
$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	
$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$	

24 Hipérbola

24.1. Ecuación general

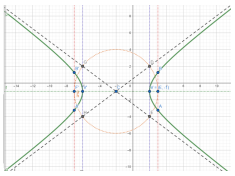
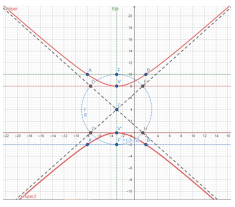
$$Ax^2 + Cy^2 + Dx + Ey + F = 0 \tag{148}$$
$$c^2 = a^2 + b^2 \tag{149}$$
$$LR = \frac{2b^2}{a} \tag{150}$$

24.2. Horizontal

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1 \tag{151}$$
$$V\left(h \pm a,\ k\right) \tag{152}$$
$$F\left(h \pm c,\ k\right) \tag{153}$$
$$B\left(h,\ k \pm b\right) \tag{154}$$
$$l_1:\ y - k = \frac{b}{a}\left(x - h\right) \tag{155}$$
$$l_2:\ y - k = -\frac{b}{a}\left(x - h\right) \tag{156}$$

24.3. Vertical

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1 \tag{157}$$
$$V\left(h,\ k \pm a\right) \tag{158}$$
$$F\left(h,\ k \pm c\right) \tag{159}$$
$$B\left(h \pm b,\ k\right) \tag{160}$$
$$l_1:\ y - k = \frac{a}{b}\left(x - h\right) \tag{161}$$
$$l_2:\ y - k = -\frac{a}{b}\left(x - h\right) \tag{162}$$

ECUACIÓN	GRÁFICA
$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	
$\frac{(y-k)^2}{b^2} - \frac{(x-h)^2}{a^2} = 1$	

25 Cálculo diferencial

25.1. Límites

$$\lim_{x\to a} c = c \tag{163}$$
$$\lim_{x\to a} x = a \tag{164}$$
$$\lim_{x\to a} c\cdot f(x) = c\cdot \lim_{x\to a} f(x) \tag{165}$$
$$\lim_{x\to a} [f(x)\pm g(x)] = \lim_{x\to a} f(x) + \lim_{x\to a} g(x) \tag{166}$$
$$\lim_{x\to a} [f(x)\cdot g(x)] = \lim_{x\to a} f(x)\cdot \lim_{x\to a} g(x) \tag{167}$$
$$\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)} \tag{168}$$
$$\lim_{x\to a} [f(x)]^n = \left[\lim_{x\to a} f(x)\right]^n \tag{169}$$

25.2. Límites indeterminados

$$\lim_{x\to\infty} \frac{c}{x^n} = 0 \tag{170}$$
$$\lim_{v\to 0} \frac{\sin v}{v} = 1 \tag{171}$$
$$\lim_{v\to 0} \frac{1-\cos v}{v} = 0 \tag{172}$$
$$\lim_{v\to 0} \frac{\cos v - 1}{v} = 0 \tag{173}$$

25.3. Derivada vía límite

$$\frac{dy}{dx} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{\Delta h} \tag{174}$$

25.4. Reglas de derivación

$$\frac{d}{dx}(c) = 0 \tag{175}$$
$$\frac{d}{dx}(cx) = c \tag{176}$$
$$\frac{d}{dx}(cx^n) = cnx^{n-1} \tag{177}$$
$$\frac{d}{dx}[cu(x)] = c\frac{du}{dx} \tag{178}$$
$$\frac{d}{dx}[v(x)^n] = nv^{n-1}\frac{dv}{dx} \tag{179}$$
$$\frac{d}{dx}[u(x)+v(x)] = \frac{du}{dx}+\frac{dv}{dx} \tag{180}$$
$$\frac{d}{dx}[u(x)\pm v(x)\pm w(x)] = \frac{du}{dx}\pm\frac{dv}{dx}\pm\frac{dw}{dx} \tag{181}$$
$$\frac{d}{dx}[u(x)v(x)] = u\frac{dv}{dx}+v\frac{du}{dx} \tag{182}$$
$$\frac{d}{dx}[u(x)v(x)w(x)] = uv\frac{dw}{dx}+uw\frac{dv}{dx}+vw\frac{du}{dx} \tag{183}$$
$$\frac{d}{dx}\left[\frac{u(x)}{v(x)}\right] = \frac{\left(v\frac{du}{dx}-u\frac{dv}{dx}\right)}{v^2} \tag{184}$$

25.5. Regla de la cadena

$$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx} \tag{185}$$

25.6. Derivadas de funciones trigonométricas

$$\frac{d}{dx}[\sin(v)] = \cos(v)\cdot\frac{dv}{dx} \tag{186}$$
$$\frac{d}{dx}[\cos(v)] = -\sin(v)\cdot\frac{dv}{dx} \tag{187}$$
$$\frac{d}{dx}[\tan(v)] = \sec^2(v)\cdot\frac{dv}{dx} \tag{188}$$
$$\frac{d}{dx}[\csc(v)] = -\csc(v)\cdot\cot(v)\cdot\frac{dv}{dx} \tag{189}$$
$$\frac{d}{dx}[\sec(v)] = \sec(v)\cdot\tan(v)\cdot\frac{dv}{dx} \tag{190}$$
$$\frac{d}{dx}[\cot(v)] = -\csc^2(v)\cdot\frac{dv}{dx} \tag{191}$$

26 Derivadas de funciones trigonométricas inversas

$$\frac{d}{dx}[\arcsin(v)] = \frac{1}{\sqrt{1-v^2}}\cdot\frac{dv}{dx} \tag{192}$$
$$\frac{d}{dx}[\arccos(v)] = -\frac{1}{\sqrt{1-v^2}}\cdot\frac{dv}{dx} \tag{193}$$
$$\frac{d}{dx}[\arctan(v)] = \frac{1}{1+v^2}\cdot\frac{dv}{dx} \tag{194}$$
$$\frac{d}{dx}[\operatorname{arccot}(v)] = -\frac{1}{1+v^2}\cdot\frac{dv}{dx} \tag{195}$$
$$\frac{d}{dx}[\operatorname{arcsec}(v)] = \frac{1}{v\sqrt{v^2-1}}\cdot\frac{dv}{dx} \tag{196}$$
$$\frac{d}{dx}[\operatorname{arccsc}(v)] = -\frac{1}{v\sqrt{v^2-1}}\cdot\frac{dv}{dx} \tag{197}$$

26.1. Derivadas de funciones logarítmicas y exponenciales

$$\frac{d}{dx}[\log_a(v)] = \frac{1}{v}\cdot\log_a(e)\cdot\frac{dv}{dx} \tag{198}$$
$$\frac{d}{dx}[\ln(v)] = \frac{1}{v}\cdot\frac{dv}{dx} \tag{199}$$
$$\frac{d}{dx}\left[a^{(v)}\right] = a^v\cdot\ln(a)\cdot\frac{dv}{dx} \tag{200}$$
$$\frac{d}{dx}\left[e^{(v)}\right] = e^v\cdot\frac{dv}{dx} \tag{201}$$
$$\frac{d}{dx}\left[u^{(v)}\right] = vu^{v-1}\cdot\frac{du}{dx}+u^v\cdot\ln(u)\cdot\frac{dv}{dx} \tag{202}$$

27 Cálculo integral

27.1. Reglas de integración

$$\int (u \pm v)\,dx = \int (u)\,dx \pm \int (v)\,dx \tag{203}$$

27.2. Integrales inmediatas

$$\int x^n dx = \frac{x^{n+1}}{x+1} + C \tag{204}$$

$$\int v^n dx = \frac{v^{n+1}}{n+1} + C \tag{205}$$

$$\int \frac{dv}{v} = \ln|v| + C \tag{206}$$

$$\int e^v dv = e^v + C \tag{207}$$

$$\int a^v dv = \frac{a^v}{\ln(a)} + C \tag{208}$$

$$\int \ln(v)\,dv = v\ln(v) - v + C \tag{209}$$

$$\int \sin(v)\,dv = -\cos(v) + C \tag{210}$$

$$\int \cos(v)\,dv = \sin(v) + C \tag{211}$$

$$\int \tan(v)\,dv = -\ln|\cos(v)| + C \tag{212}$$

$$\int \csc(v)\cot(v)\,dv = -\csc(v) + C \tag{213}$$

$$\int \sec(v)\tan(v)\,dv = \sec(v) + C \tag{214}$$

$$\int \cot(v)\,dv = \ln|\sin(v)| + C \tag{215}$$

$$\int \csc(v)\,dv = \ln|\csc(v) - \cot(v)| + C \tag{216}$$

$$\int \sec(v)\,dv = \ln|\sec(v) + \tan(v)| + C \tag{217}$$

$$\int \sec^2(v)\,dv = \tan(v) + C \tag{218}$$

$$\int \csc^2(v)\,dv = -\cot(v) + C \tag{219}$$

$$\int \arcsin(ax)\,dx = x\arcsin(ax) + \frac{1}{a}\sqrt{1-a^2x^2} + C \tag{220}$$

$$\int \arccos(ax)\,dx = x\arccos(ax) - \frac{1}{a}\sqrt{1-a^2x^2} + C \tag{221}$$

$$\int \arctan(ax)\,dx = x\arctan(ax) - \frac{1}{2a}\ln\left(1+a^2x^2\right) + C \tag{222}$$

27.3. Integrales: $\sqrt{v^2 \pm a^2}$, $\sqrt{a^2 - v^2}$, $v^2 \pm a^2$, $a^2 - v^2$

$$\int \frac{dv}{v^2+a^2} = \frac{1}{a}\arctan\left(\frac{v}{a}\right) + C \tag{223}$$

$$\int \frac{dv}{v^2-a^2} = \frac{1}{2a}\ln\left|\frac{v-a}{v+a}\right| + C \tag{224}$$

$$\int \frac{dv}{a^2-v^2} = \frac{1}{2a}\ln\left|\frac{a+v}{a-v}\right| + C \tag{225}$$

$$\int \frac{dv}{\sqrt{a^2-v^2}} = \arcsin\left(\frac{v}{a}\right) + C \tag{226}$$

$$\int \frac{dv}{\sqrt{v^2 \pm a^2}} = \ln\left(v + \sqrt{v^2 \pm a^2}\right) + C \tag{227}$$

$$\int \frac{dv}{v\sqrt{v^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\left(\frac{v}{a}\right) + C \tag{228}$$

$$\int \sqrt{a^2-v^2}dv = \frac{v}{2}\sqrt{a^2-v^2} + \frac{a^2}{2}\arcsin\left(\frac{v}{a}\right) + C \tag{229}$$

$$\int \sqrt{v^2 \pm a^2}dv = \frac{v}{2}\sqrt{v^2 \pm a^2} \pm \frac{a^2}{2}\ln\left(v + \sqrt{v^2 \pm a^2}\right) \tag{230}$$

28 Sumatorias

28.1. Propiedades

$$\sum_{i=a}^{n} k = (n-a+1)k \tag{231}$$

$$\sum_{i=a}^{n}[f(i)+g(i)] = \sum_{i=a}^{n} f(i) + \sum_{i=a}^{n} g(i) \tag{232}$$

$$\sum_{i=a}^{n} c\cdot f(i) = c\sum_{i=a}^{n} f(i) \tag{233}$$

$$\sum_{i=a}^{n}[f(i)-f(i-1)] = f(n) - f(0) \tag{234}$$

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28.2. Sumas básicas

$$\sum_{i=1}^{n} k = kn \tag{236}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \tag{237}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \tag{238}$$

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4} \tag{239}$$

$$\sum_{i=1}^{n} i^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30} \tag{240}$$

28.3. Sumas de Riemann

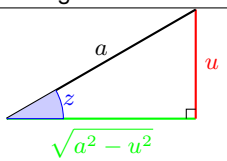
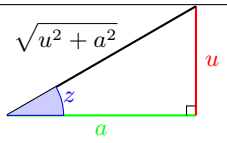
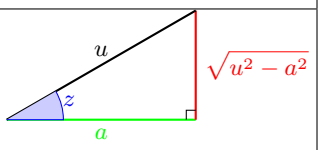
28.3.1. Rectángulos inscritos

$$A = \lim_{n\to\infty}\sum_{i=1}^{n}\left(\frac{b-a}{n}\right) f\left(a+(i-1)\Delta x\right)$$

28.3.2. Rectángulos circunscritos

$$A = \lim_{n\to\infty}\sum_{i=1}^{n}\left(\frac{b-a}{n}\right) f\left(a+i\Delta x\right)$$

28.4. Integración por sustitución trigonométrica

Caso	Cambio	Diferencial	Transformación	Triángulo
$\sqrt{a^2-u^2}$	$u=a\sin(z)$	$du=a\cos(z)dz$	$\sqrt{a^2-u^2}=a\cos(z)$	
$\sqrt{u^2+a^2}$	$u=a\tan(z)$	$du=a\sec^2(z)dz$	$\sqrt{u^2+a^2}=a\sec(z)$	
$\sqrt{u^2-a^2}$	$u=a\sec(z)$	$du=a\sec(z)\cdot\tan(z)dz$	$\sqrt{u^2-a^2}=a\tan(z)$	

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