Formulario de Cálculo I

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Sucesiones y Series

- Sucesión aritmética: $t_n = t_1 + (n-1)(d)$
- Sucesión geométrica: $t_n = (t_1)(r^{n-1})$ * $r = \frac{t_{n+1}}{t_n}$
- Serie aritmética: $S_n = \frac{n(t_1 + t_n)}{2}$ * $t_n = S_n - S_{n-1}$
- Serie Geométrica: $S_n = \frac{t_1(r^{n-1})}{1-r}$ $|r|>1$ / $S_n = \frac{t_1(1-r^n)}{1-r}$* $|r|<1$

Cociente de cubos

$$\frac{a^3+b^3}{a+b} = a^2 - ab + b^2$$

$$\frac{a^3-b^3}{a-b} = a^2 + ab + b^2$$

$y = mx + b$
$y - y_1 = m(x - x_1)$

$(x-h) = -4p(y-k)$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Fermat: $$\lim_{x \to a} \frac{f(x) - f(a)}{x-a}$$

- $f'(x) = n x^{n-1}$
- $f'(x) = u v' + u' v$
- $f'(x) = \frac{v u' - v' u}{v^2}$
- $\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1}[f'(x)]$

* $\sqrt{x} = x^{1/2}$
* $\frac{1}{x} = x^{-1}$
* $\frac{1}{\sqrt{x}} = x^{-1/2}$

DERIVADAS

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$ Newton

$$f'(x) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$ Fermat

$\sqrt{x} = x^{1/2}$ $\quad \frac{1}{x} = x^{1/2}$ $\quad \frac{1}{\sqrt{x}} = x^{-1/2}$

* La segunda derivada → máximo/mínimo
* Primera derivada → Sacar puntos críticos

Negativo → máximo
Positivo → mínimo
} segunda derivada

$y = mx + b$

① $f'(x) = x n^{x-1}$ ② $f'(x) = uv' + u'v$

③ $f'(x) = \frac{vu' - v'u}{v^2}$ ④ $\frac{d}{dx}[F(x)]^n = n[f(x)]^{n-1}[f'(x)]$

$f' x = uwv' + uw'v + u'wv$

Derivadas Trigonométricas

* $\operatorname{sen} x = x' \cos x$

$\frac{d}{dx} \operatorname{sen} x = \cos x$ $\quad \frac{d}{dx} \cos x = -\operatorname{sen} x$

$\frac{d}{dx} \tan x = \sec^2 x$ $\quad \frac{d}{dx} \cot x = -\csc^2 x$

$\frac{d}{dx} \sec x = \sec x \tan x$ $\quad \frac{d}{dx} \csc = -\csc \cot x$

Reciprocas

$\operatorname{sen} x = \frac{1}{\csc x}$ $\quad \cos x = \frac{1}{\sec x}$ $\quad \tan x = \frac{1}{\cot x}$

$\csc x = \frac{1}{\operatorname{sen} x}$ $\quad \sec x = \frac{1}{\cos x}$ $\quad \tan = \frac{\operatorname{sen} x}{\cos x}$

Pitagóricas

$$\operatorname{sen}^2 x + \cos^2 x = 1$$
$$1 + \cot^2 x = \csc^2 x$$
$$\tan^2 x + 1 = \sec^2 x$$

Trigonométricas

① $\operatorname{sen}\alpha - \operatorname{sen}\beta = 2\operatorname{sen}\left(\frac{\alpha-\beta}{2}\right)\cos\left(\frac{\alpha+\beta}{2}\right)$

② $\operatorname{sen}(\alpha)\operatorname{sen}(\beta) = \frac{\cos(\alpha-\beta) - (\cos\alpha+\beta)}{2}$

③ $\operatorname{sen}\left(\frac{\alpha}{2}\right) = \sqrt{\frac{1-\cos\alpha}{2}}$

④ $\cos\left(\frac{\pi}{2} - \alpha\right) = \operatorname{sen}\alpha$

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* Función
* Derivar función
* Igualar a cero
* Sacar puntos críticos
* Segunda derivada
* Sustitución puntos críticos en 2da derivada y obtener max/min

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- $f(x) = e^v$ → $f'(x) = e^v \cdot v'$
- $f(v) = a^v$ → $f'(x) = a^v \cdot v' \cdot \ln a$
- $f(x) = \ln x$ → $f'(x) = \frac{1}{x}$ / $f(x) = \ln v$ → $f'(x) = \frac{1}{v} \cdot v'$
- $f(v) = \log_b x$ → $f'(x) = \frac{1}{x \ln b}$

- $\log_a(bc) = \log_a b + \log_a c$
- $\log_a\left(\frac{b}{c}\right) = \log_a b - \log_a c$
- $\log_a b^n = n\log_a b$

INTEGRALES

- $\int a x^n dx = \frac{a}{n+1} x^{n+1} + C$ * $\int \frac{1}{x} = \ln|x|$
- $\int (f+g)dx = \int f dx + \int g dx$
- $\int A \cdot f dx = A \int f dx$

Trigonométricas

- $\int \cos x dx = \operatorname{sen} x + C$
- $\int \operatorname{sen} x dx = -\cos x + C$
  - $\int -\operatorname{sen} x dx = \cos x + C$
- $\int \sec^2 x dx = \tan x + C$
- $\int -\csc^2 x dy = -\int \csc^2 x dx = -\cot x + C$
- $\int \sec x \cdot \tan x dx = \sec x + C$
- $\int \csc x \cdot \cot x dx = -\csc x + C$
- $\int \tan x dx = -\ln|\cos x| = \ln|\sec x| + C$
- $\int \cot x dx = \ln|\operatorname{sen} x| + C$
- $\int \sec x dx = \ln|\sec x + \tan x| + C$
- $\int \csc x dx = \ln|\csc x - \cot x| + C$

Logaritmicas / Exponenciales

- $\int e^x dx = e^x$

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

$\int e^{5x} dx$

$e^{5x} = \int 5e^{5x} dx$

$e^{5x} = 5\int e^{5x} dx$

$\int e^{5x} dx = \frac{e^{5x}}{5} + C$

$\int (6x-2)^5 dx = \frac{(6x-2)^6}{36}$

$\frac{d}{dx}(6x-2)^6 = 6(6x-2)^5(6)$

$(6x-2)^6 = 36\int (6x-2)^5$

$\int (6x-2)^5 = \frac{(6x-2)^6}{36} + C$

▶ $\int u^n \, du = \frac{u^{n+1}}{n+1} + C$] sustitución

▶ $\int \ln(x) \, dx = x \ln(x) + x + C$

▶ $\int u \, dv = uv - \int v \, du$] Por partes

$$S \sum_{i=1}^{n} f(x_i)(x_i - x_{i-1}) = \sum f(x_i)(\Delta x)$$

$x_i = \underbrace{a}_{\text{inicio}} + i \Delta x \qquad \Delta x = \frac{\text{Intervalo}}{n} = \frac{b-a}{n}$

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constante	i	i^2	i^3
n	$\frac{n(n+1)}{2}$	$\frac{n(n+1)(2n+1)}{6}$	$\frac{n^2(n+1)^2}{4}$

i^5 $+ \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$

▶ $s(t) = \int v(t) \, dt$ ▶ $v(t) = \int a(t) \, dt$