Formulario general

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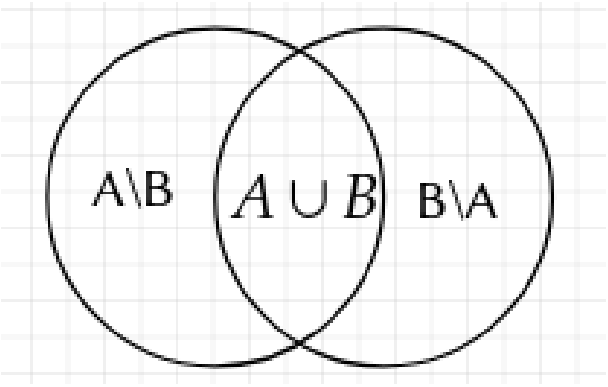
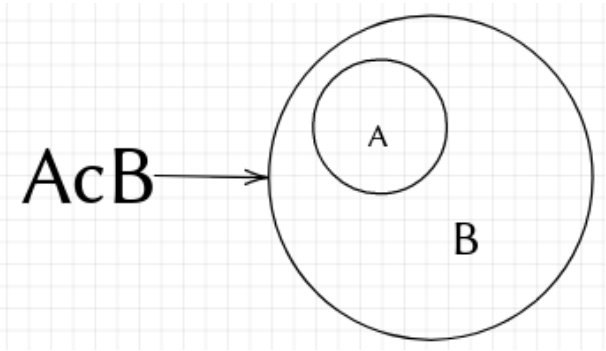
Índice

1. probability and statistics

$$P(\epsilon^c) = 1 - P(\epsilon)$$

$$P(A \cap B^c) = P(A \backslash B) = P(A) - P(A \cup B)$$





$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$A \cap (B \cup A) = (A \cap B) \cup (A \cap B)$$

$$A \cup (B \cup A) = (A \cup B) \cup (A \cup B)$$

1.1. Independent Events

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$p(A|B) = P(A \cup B) = p(A) * P(B)$$

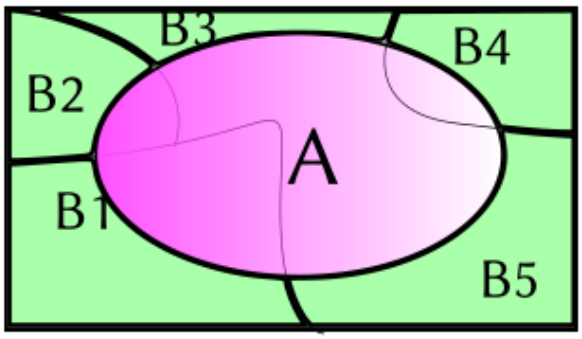
1.2. morgan laws

$$A^c \cup B^c = (A \cap B)^c$$

$$A^c \cap B^c = (A \cup B)^c$$

$$| = dadoque$$

1.3. separated probabilities



Sean B_k Eventos mutuamente excluyentes, paritición de S

$$P(A) = P(B_1)P(A|B_1) + P(B_2)P(A|B_2) + ... + P(B_k)P(A|B_k!)$$

$$P(A) = \sum_{i=1}^{k} P(B_i)P(A|B_k)$$

$$P(B_i|A) = \frac{P(B_i) * P(A|B_i)}{P(A)}$$

$$P(B_i|A) = \frac{P(B_i) - P(A|B_i)}{\sum_{i=1}^{k} P(B_i)P(A|B_k)}$$

$$a^{\Phi(m)} = 1(mod\ m)$$

$\Phi(p \times q) = (p-1)(q-1)$ para pq primos

$$\Phi(p_1^{k_1} \times ... \times p_n^{k_n}) = (p_1^{k_1} - p_1^{k_1-1}) \times ... \times (p_n^{k_n} - p_n^{k_n-1})$$

2. Ecuaciones Diferenciales

2.1. linearity

$$a_n(x)\frac{d^n y}{dx^n} + ... + a_1(x)\frac{dy}{dx} + a_0(x)y = f(x)$$

2.2. homogeneous ecuations

given:

$$M(x,y)dx + N(x,y)dy = 0$$

the ecuation is homogeneous if M and N are homogeneous functions of the same exponent cambio de variable $y = ux$ o $x = uy$, $dy = xdu + udx$ Subsección 2.3

2.3. homogeneous function of grade n

$$f(tx,ty) = t^n f(x,y)$$

2.4. Exact ED

para ser exacta tiene que cumplir dos condiciones

1. $M(x,y)dx + N(x,y)dy = 0$
2. $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

si no las cumple puedes usar el factor integrante para que cumpla Subsección 2.8

para resolver toma en cuenta las siguientes dos cosas

$$f(x,y) = \int M dx + g(y) = \int N dy + h(x)$$

$$\frac{\partial F}{\partial x} = M \ , \ \frac{\partial F}{\partial y} = N$$

2.5. Bernouully ecuation

aplica cuando la ecuacion diferencial tiene la siguiente forma:

$$P_0(x)\frac{dy}{dx} + P(x)y = F(x)y^n$$

se hace el cambio de variable $u = y^{1-n}$ y se obtiene una ecuacion lineal

2.6. Ricat Ecuation

tiene la siguiente forma

$$y^{'} = Q(x)y^2 + P(x)y + R(x)$$

se hace la sustitucion $y = y_1 + u^{-1}$

2.7. Cauchy Euler ecuation

se usa para resolver una ecuacion de segundo grado

$$ax^2y'' + bxy' + cy = 0$$

$$y = x^r \ , \ x > 0$$

2.8. integrant factor

aplica cuando hay una $f(x, y)$ tal que $f(x, y)(ED) = exacta$

- si $\frac{M_y - N_x}{N}$ es funcion solamente de x entonces $P(x) = \frac{M_y - N_x}{N}$

$$f(x) = e^{\int P(x)dx} \text{ es un factor de integracion}$$

- si $M_y - N_x = m\frac{N}{x} - n\frac{M}{y}$ entonces

$$f(x) = x^m y^n \text{ es un factor de integracion}$$

used by Elemento 2.4

2.9. Linear differential equations

$$\frac{dy}{dx} + P(x)y = q(x)$$

$$u(x) = e^{\int P(x)dx}$$

Sol $= u(x)y = \int u(x)q(x)dx$

2.10. Order Reduction

aplica cuando conoces una solucion de una ED Lineal homogenea de segundo orden

$$y_2 = y_1 \int \frac{e^{-\int P(x)dx}}{y_1^{'}} dx$$

$$y^{''} + P(x)y^{'} + q(x)y = 0$$

2.11. Constant coeficients Ecuation

para poder resolver por este metodo tiene que ser una ecuacion lineal de coeficientes constantes de la forma

$$y^{''}C_1 + y'C_2 + yC_3 = 0$$

se hace la sustitucion

$$y = e^{rx}$$

quedara una funcion cuadratica en terminos de r

se puede llegar a usar la identidad de euler

la solucion queda de la forma:

$$y = C_1 e^{r_1 x} + C_2 e^{r_2 x}$$

tambien puede servir:

$$r = a + bi$$

$$y_1 = C_1 * e^{\alpha x} \cos(bx)$$

$$y_2 = C_2 * e^{\alpha x} \operatorname{sen}(bx)$$

nota: si hay multiplicidad, ejemplo: $(r-1)^3 = 0$

$$y_h = e^{rx} + xe^{rx} + x^2 e^{rx}$$

siendo que r = 1 entonces:

$$y_h = e^{x} + xe^{x} + x^2 e^{x}$$

2.12. parameter variation

tienen la forma $k_1y'' + k_2y' + k_3y = f(x)$

$$u_1 = -\int \frac{y_2 f(x)}{W} dx \qquad u_2 = \int \frac{y_1 f(x)}{W} dx$$

$$W = \begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix}$$

siendoy_h la solucion de la ecuacion homogenea asociada

$$y_h = C_1y_1 + C_2y_2$$

y siendo y_p la solucion definitiva

$$y_p = u_1y_1 + C_2y_2$$

2.13. Indeterminate Coeficients

$$r(x) = \text{polinomio, exponencial, Seno, Coseno}$$

pasos:

1. Calcular y_n es decir calcular la ecuacion homogenea relacionada, por coeficientes constantes
2. Encontrat y_p

caso 1 No hay funciones en comun con r(x)

nota: tomar en cuenta el teorema de superposicion de soluciones si

$$r(x) = x^3 + x + 10 \operatorname{sen} 8x$$

simplemente se suman los proposiciones

$$y_p = Ax^3 + Bx^2 + Cx + D + A\,\mathrm{sen}(8x) + B\cos(8x)$$

y lo mismo aplica para la multiplicacion

- $y'' + C_1 y' + c_2 y = x^3 + x$
  proponer $\rightarrow y_p = Ax^3 + Bx^2 + Cx + D$
- $y'' + C_1 y' + c_2 y = 10\,\mathrm{sen}\,8x$
  proponer $\rightarrow y_p = A\,\mathrm{sen}(8x) + B\cos(8x)$
- $y'' + C_1 y' + c_2 y = 12e^{5x}$
  proponer $\rightarrow y_p = Ae^{5x}$

caso 2 hay funciones que coinciden con r(x)

simplemente multiplicar la funcion for x hasta que no hayas funciones en comun con x pero tiene que ser la x^n mas pequena posible

3. Numerical Calculus

3.1. Taylor Polinomial

$$f(x) \approx f(x_0) + f^{'}(x_0)(x - x_0) + \frac{f^{''}(x - x_0)^2}{2!}$$

$$= \sum_{i=0}^{n} \frac{f^i(x_0)(x - x_0)^i}{i!}$$

3.2. Newton Raphson

$$P_{n+1} = P_n - \frac{f(P_0)}{f'(P_0)}$$

3.3. Complement to one

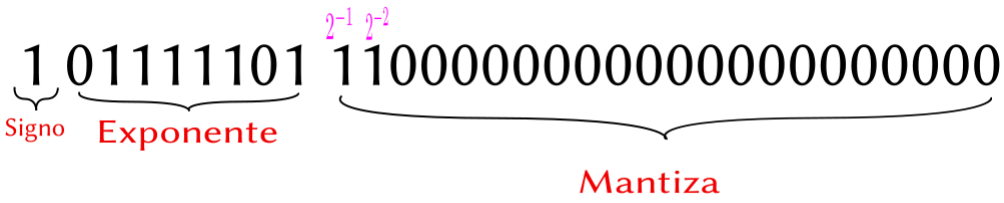
3.4. complement to two

se cambian 1 por ceros y viceversa

3.5. complemento a dos

de derecha a izquierda y apartir del primer 1 encontrado sin incluirlo se hace la operacion de complemento a uno

3.6. convertir de punto flotante a decimal



Ejemplo:

$$(-1) \times (1 + mantisa) \times 2^{expo - maxExpo}$$

$$(-1) \times (1 + 0{,}75) \times 2^{124-127}$$

$$= -0{,}21875$$

3.7. convert decimal to float

Ejemplo:

$$171{,}25 = 10101011, 01$$

Se pasa a una forma con exponente dejando solo un entero

$$1, 010101101 \times 2^7$$

El primer bit es de signo

$$1 = -$$

$$0 = +$$

Los siguientes 8 numeros son el maximo exponente mas el exponente al que esta elevado el 2

$$127 + 7 = 134$$

se convierte el 134 a base 2

$$134_10 = 10000110_2$$

y la parte decimal es la mantiza, que queda igual

$$010101101$$

3.8. Convert decimal fraction to float

para convertir de fraccionario a binario primero se convierte la parte entera y la parte fraccionaria se convierte usando el siguiente codigo

Codigo:

```
//se da un flotante de la forma 0.321312 con
//el numero de digitos a convertir
//ejemplo
//in: 0.42344 3
//out: .001
string FraccionBinaria(float FraccionDecimal,int Nume
{
        string ans = ".";
        for(int i=0;i<NumeroDeDigitos;i++)
        {
                FraccionDecimal*=2;
                if(FraccionDecimal > 1.0)
                {
                        FraccionDecimal-=1.0;
                        ans.push_back('1');
                }
                else
                {
                        ans.push_back('0');
                }
        }
        return ans;
}
```

3.9. Fixed point iteration

de una ecuacion se despeja x y se substituye, tomando el resultado anterior empezando desde una x arbitraria

3.10. Divided differences

$$f[x_0, x_1] = \frac{f(x_1) - f(x_0)}{x_1 - x_0}$$

$$f[x_0, x_1, x_2] = \frac{f(x_1, x_2) - f(x_0, x_1)}{x_2 - x_0}$$

$$f[x_0, x_1, x_2, x_3] = \frac{x_2, x_3) - f(x_0, x_1)}{x_3 - x_0}$$

$$P_n = a_0 + a_1(x - x_0) + a_2(x - x_0)(x - x_1) + ... + a_n(x - x_0) \times ... \times (x - x_n)$$

j	X_j	$f(X_j)$	1	2
0	X_0	$f(X_0)$	1	1
1	X_1	$f(X_1)$	$f(X_0, X_1)$	1
2	X_2	$f(X_2)$	$f(X_1, X_2)$	$f(X_0, X_1, X_2)$

3.11. Lagrange Polinomial

$$P_n(x) = \sum_{i=0}^{n} L_i(x) f(x_i)$$

$$L_i(x) = \prod_{\substack{j=0 \\ j \neq i}}^{n} \frac{(x - x_j)}{(x_i - x_j)}$$

4. Algebra

4.1. factorization

1. common factor
2. common factor by agroupation of terms
3. cubic differences
4. perfect square trinomial
5. trinomial of the form $x^2 + bx + c$
6. trinomial of the form $ax^2 + bx + c$
7. sum and difference of cubes
8. sintetic divition
9. general formula

4.2. Sintetic divition

Example:

$$x^3 - 5x^2 + 2x + 8$$

Taking the divisors of the independent term

$$p = D_8 = \{\pm 1, \pm 2, \pm 4, \pm 8\}$$

and the divisors of the term with the highest exponent

$$q = D_1 = \{\pm 1\}$$

$$p/q = \{\pm 1, \pm 2, \pm 4, \pm 8\}$$

now all the posibilities are in the space p/q that are integers so:

x^3	x^2	x	TI	
1	-5	2	8	
	-1	6	-8	
				$x = -1$
1	-6	8	0	

then:

$$(x^2 - 6x + 8)(x + 1)$$

then:

$$(x + 1)(x - 4)(x - 2)$$

4.3. cubic differences

$$u^3 + 1 = (u^2 - u + 1)(u + 1)$$
$$u^3 - 1 = (u^2 + u + 1)(u - 1)$$

4.4. general formula

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

5. Arch Linux

5.1. Mantainance

```
#check file size
du -sh .cache/
#remove a file
rm -rt .cache/
#delete what you don't need in .config file
```

specific mantainance:

```
#check the failed systems
systemctl --failed
#check the systemd journal
sudo journalctl -p 3-xb
#if the system doesn't boots then ctrl+alt+shift the
#then update mirrors
#clar chache

#then to update the whole system use:
sudo pacman -Syyu
#to check system updates
sudo pacman -Syu
#if you wan't to remove all packages in the drive us
sudo pacman -Scc
#remove all unwanted dependencies
paru -Yc
#remove orphan packages
sudo pacman -Rns \$(pacman - Qdtq)
#sudo pacman -Syyy Syncrhonise data use "mirror1"
```

5.2. Print in arch linux

install packages: usbutils, lsusb, cups
use this to make cups usable

```
sudo systemct enable cups
sudo systemctl start cups
localhost:631

lp -d HP_Officejey_Pro_8600]
```

5.3. configure date and time

```
hwclock --set --date = "04/32/2021 19:00:00"
hwclock -hctosys
```

5.4. Configure wireless

```
#when entering an iso
iwctl
#then in the ui

#to list all available devices
device list

#to scan networks
station <device> scan

#to get newworks
station <device> get-network
```

```
#to connect to a network
station <device> connect "<name of network>"

#to check if the connection is staable
ping -c s 8.8.8.8

#don't forget before rebooting the iso run
pacman nmtui
```

dwm basic configuration

```
#MODKEY + shift + q to restart X server
startx # to start the X server
```

5.5. mount devices

mount usb sticks:

```
#to mount a usb stick
mount /dev/sdb1 /mnt/<destination folder>
#to unmount a sub stick
umount /dev/sdb1
```

mount an android device:

```
#to mount and android device
simple-mtpfs --device 1 tablet/

#to unmount an android device
fusermount -u /tablet
```

6. Latex

6.1. commonly used special symbols

use the shortcut created to don't waste time
\= \textbackslash
|= \textbar
_ = _

6.2. Greek and Hebrew Letters

α	\ alpha	κ	\ kappa	ψ	\ psi
β	\ beta	λ	\ lambda	ρ	\ rho
χ	\ chi	μ	\ mu	τ	\ tau
ϵ	\ epsilon	$\o$	\ o	θ	\ theta
η	\ eta	ω	\ omega	υ	\ upsilon
γ	\ gamma	ϕ	\ phi	ξ	\ xi
ι	\ iota	π	\ pi	ζ	\ zeta
$\digamma$	\ digamma	Δ	\ Delta	Θ	\ Theta
ε	\ varepsilon	Γ	\ Gamma	Υ	\ Upsilon
$\varkappa$	\ varkappa	Λ	\ Lambda	Ξ	\ Xi
φ	\ varphi	Ω	\ Omega		
ϖ	\ varpi	Φ	\ Phi	$\aleph$	\ aleph
ϱ	\ varrho	Π	\ Pi	$\beth$	\ beth
ς	\ varsigma	Ψ	\ Psi	$\daleth$	\ daleth
ϑ	\ vartheta	Σ	\ Sigma	$\gimel$	\ gimel

6.3. math constructs

$\frac{abc}{xyz}$	\frac{abc}{xyz}	$\overline{abc}$	\overline{abc}	$\overrightarrow{abc}$	\overrightarrow{abc}
f'	\f'	$\underline{abc}$	\underline{abc}	$\overleftarrow{abc}$	\overleftarrow{abc}
$\sqrt{abc}$	\sqrt{abc}	$\widehat{abc}$	\widehat{abc}	$\overbrace{abc}$	\overbrace{abc}
$\sqrt[n]{abc}$	\sqrt[n]{abc}	$\widetilde{abc}$	\widetilde{abc}	$\underbrace{abc}$	\underbrace{abc}

6.4. Delimeters

|	—	{	\ {	⌊	\lfloor	/	/
|	\vert	{	\}	⌋	\rfloor	\	\backslash
‖	\\|	⟨	\langle	⌈	\lceil	[	[
‖	\Vert	⟩	\rangle	⌉	\rceil	]	]

use the pair /lefts and /rights

example:

\left| *expr* \right|

6.5. Variable Sized simbols

$\sum$	\sum	$\int$	\int	$\biguplus$	\biguplus
$\prod$	\prod	$\oint$	\oint	$\bigcap$	\bigcap
$\coprod$	\coprod	$\iint$	\iint	$\bigcup$	\bigcup
$\bigoplus$	\bigoplus	$\bigvee$	\bigvee	$\bigotimes$	\bigotimes
$\bigwedge$	\bigwedge	$\bigodot$	\bigodot	$\bigsqcup$	\bigsqcup

6.6. binary operation relation symbols

$\cap$	\cap	$\cup$	\cup
$\uplus$	\uplus	$\sqcup$	\sqcup
$\sqcap$	\sqcap	$\wedge$	\wedge
$\vee$	\vee	$\equiv$	\equiv
$\neq$	\neq	$\simeq$	\simeq
$\approx$	\approx	$\doteq$	\doteq
$\subset$	\subset	$\because$	\because
$\sqsubset$	\sqsubset	$\sqsubseteq$	\sqsubseteq
$\geq$	\geq	$\therefore$	\therefore

6.7. arrow symbols

$\leftarrow$	\leftarrow	$\Leftarrow$	\Leftarrow
$\rightarrow$	\rightarrow	$\Rightarrow$	\Rightarrow
$\leftrightarrow$	\leftrightarrow	$\Leftrightarrow$	\Leftrightarrow
$\uparrow$	\uparrow	$\Uparrow$	\Uparrow
$\downarrow$	\downarrow	$\Downarrow$	\Downarrow
$\updownarrow$	\updownarrow	$\Updownarrow$	\Updownarrow
$\nearrow$	\nearrow	$\searrow$	\searrow
$\swarrow$	\swarrow	$\nwarrow$	\nwarrow

6.8. miscelanious

∞	\infty	∂	\partial
$\cdots$	\cdots	$\vdots$	\vdots
$\vdots$	\vdots	$\ldots$	\ldots
$\ddots$	\ddots	$\forall$	\forall
$\exists$	\exists	$\nexists$	\nexists
$\emptyset$	\emptyset	$\angle$	\angle
$\angle$	\angle	$\measuredangle$	\measuredangle
$\cap$	\cap	$\cap$	\cap
$\cap$	\cap	$\cap$	\cap

6.9. Matrices

matrices		
type	latex markup	Renders as
Plain	$\begin{<opt>matrix}$ 1 2\\ 2 3 $\end{<opt>matrix}$	1 2 3 4

$< opt >$:

in this part you can specify which kind of matrix you wan't so you can place p: parenthesis matrix ()

b:bracket matrix []

B: for braces matrix

v: for pipes matrix —

V: for double pipe ——

7. Diferential Calculus

$$(\tan(x))' = \sec^2(x),\ (\csc(x))' = \csc(x)cot(x)$$

$$(\sec(x))' = \sec(x)\tan(x),\ (\cot(x))' = -\csc^2(x)$$

$$(\ln(x))' = \frac{1}{x}$$

$$(a^x)' = a^x ln(a) * x'$$

$$(\frac{f(x)}{g(x)})' = \frac{g(x)f(x)' = g(x)'f(x)}{(g(x))^2}$$

8. Integral Calculus

9. Trigonometry

9.1. Basic Identities

$$\cos(\alpha) = \frac{1}{2}[\cos(\alpha - \beta) + \cos(\alpha + \beta)]$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sinh(x) = \frac{e^x - e^{-x}}{2}$$

$$\cosh(x) = \frac{e^X + e^{-x}}{2}$$

$$\sin(x)\cos(y) = \frac{1}{2}[\sin(x + y) + \sin(x - y)]$$

9.2. Double Angle

$$\sin(2\theta) = 2\sin(\theta)cos(\theta)$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

$$\cos(2\theta) = 2cos^2\theta - 1$$