Contents

As of June 20, 2022

Contents

file <- “/home/jim/code/publish_project/MATH/100_math_examles.md”

PURPOSE: Collect examples of math/latex here: vectors, equations, align, symbols etc.

This is markdown file. Using print_pdf.sh % out.pdf pandoc will produce .pdf files with appropriate latex packages.

use of grave symbol:
`$singlequote'$
``$doublequote''$

```
in latex:
$\$10.25$
```

$10.25

$$x = \begin{cases} 0 & \text{if x odd,} \\ 1 & \text{if x even.} \end{cases}$$

Let V be vector space and B be basis.

$$\vec{p}$$

dot product

```
$$ \vec{p}\cdot\vec{q}=|\vec{p}|\vec{q}|cos\theta $$
```

magnitude

$$|\vec{a}|$$

unit vector

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

matrix:

$$\begin{matrix} a & b \\ c & d \end{matrix}$$

matrix with subscripts

$$\begin{matrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{matrix}$$

matrix with square brackets (bmatrix)

$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \tag{1}$$

matrix with dots ...

$$\begin{bmatrix} a_1 \\ \vdots \\ a_n \end{bmatrix} \tag{2}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \tag{3}$$

As we can see from eqn ~(1) and ~(3) ...

align equal signs

$$y = x^2 \tag{4}$$
$$z = y^2 \tag{5}$$

align left A

$$y = x^2 \tag{6}$$
$$z = y^2 \tag{7}$$

$$A = B = C \tag{8}$$
$$D = E = F \tag{9}$$

$$x - 1 = y \tag{10}$$
$$x = y + 1 \tag{11}$$

Still centered, but note alignment has changed.

$$x - 1 = y \tag{12}$$
$$x = y + 1 \tag{13}$$

```
inline
 $\frac{n!}{k!(n-k)!} = \binom{n}{k}$
```

$\frac{n!}{k!(n-k)!} = \binom{n}{k}$

Independent Samples

$$\mu_{\bar{x_1}-\bar{x_2}} = \mu_1 - \mu_2$$

$$\sigma^2_{\bar{x_1}-\bar{x_2}} = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$$

$$\mu_{\hat{p}_1-\hat{p}_2} = p_1 - p_2$$

$$\sigma^2_{\hat{p}_1-\hat{p}_2} = \frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}$$

$$\underbrace{\overbrace{a+b+c}^{6} \cdot \overbrace{d+e+f}^{7}}_{\text{some words}} = 42$$

$\mathbb{R}$

abc abc

Example of newcommand

short cut to say vector

::: REF: see Michelle videos ::: latex ignores, but prints the line.

LaTeX

% SOFT vs HARD return

This is one line. \ That was a soft return, which is why this is NOT a new paragraph. And outdent is because it second line of paragraph.

% HARD But this is also one line. That was hard return. Difference?

$$\sqrt{2}$$

$$\sqrt[3]{2}$$

$$\ln x$$

Probability

$$X \in \mathcal{P}(A)$$

|number of elments | = 2^k

$$A \cup B$$
$$\cup_{i=1}^{n} A_i$$
$$\bigcup_{i=1}^{n} A_i$$

$$A \cap B$$
$$\bigcap_{i=1}^{n} A_i$$

$$N_h = N * P(H)$$

$$P(A \mid B)$$

$$p(\theta|D) = \frac{p(D|\theta)p(\theta)}{p(D)}$$

Let $\pi \in [0, 1]$ be a random variable. Then function f(π) is probability density function (pdf) if

$$f(\pi) > 0 \forall \pi$$

(write P (a-b))

$$\int_{\pi} f = 1$$

One model for pdf of f is **Beta** which often used in **conjugacy** (same family of distributions for both prior and posterior, with only parameters varying)

Using Bayes,

$$P(F \mid E) = \frac{P(E \mid F)P(F)}{P(F)} \tag{14}$$

Binary Functions

Y is the number of successes in a fixed number of trials (n)

$$Y|\pi \sim Bin(n, \pi)$$

$$f(y|\pi) = \binom{6}{y} \pi^y (1-\pi)^{6-y} \quad for \quad y \in \{0, 1, 2, 3, 4, 5, 6\}$$

We can use the prior for π and all y to calculate each probabilities.

```
latex code
$\frac{n!}{k!(n-k)!} = \binom{n}{k}$
```

$$\frac{n!}{k!(n-k)!} = \binom{n}{k}$$

$$\binom{6}{y} \pi^y (1-\pi)^{6-y}$$

$$\begin{aligned} X &= 5 + 2 + 3 \\ &= (5 + 2) + 3 \end{aligned}$$