

L^AT_EX Demo

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1 Basic Math Stuff

Many of the common math symbols you use in reports have very intuitive commands from within L^AT_EX. Also, all of the Greek letters can be used by prefacing the name of the letter with a slash. Here is how some of them look.

```
\[ \int_{0}^{2\pi} \sin \theta d\theta \]

\[ F(x) = \sum_{t=0}^x \left( \begin{array}{c} n \\ t \end{array} \right) p^t (1-p)^{n-t} \]
% in this case we want an array with only one column
% that is aligned in the center 'c'
\begin{array}{c}
n \\
t
\end{array}
\end{array}
\right) p^t (1-p)^{n-t}
{\mathrm{ }} % a clunky way to insert some space in math mode
x = 0, 1, 2, \dots, n \]
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$$\int_0^{2\pi} \sin \theta d\theta$$
$$F(x) = \sum_{t=0}^x \binom{n}{t} p^t (1-p)^{n-t} \quad x = 0, 1, 2, \dots, n$$
$$\frac{x}{x+1}$$

In this Section 1 we showed a couple quick examples of inserting math in a document. In Section 2 we will expand on this to show multiline equations, and in Section 4 we will show how to include figures and tables in your documents. And just for kicks I will cite a couple references from Kirlik [5] and Erev [4].

2 More advanced math stuff

2.1 Matrices

Matrices are commonly used in all kinds of applications, and they are easy to include in a L^AT_EX document by wrapping an array inside of square brackets.

$$\hat{\mathbf{B}} = \begin{bmatrix} -3.0638 & 0.6750/2 & -0.5250/2 \\ 0.6750/2 & -1.2138 & 1.4250/2 \\ -0.5250/2 & 1.4250/2 & -2.1638 \end{bmatrix}$$

*I would like to thanks Jimmy John's for bringing tasty sandwiches

2.2 Multi-line Equations and Derivations: eqnarray

$$f_{R|\mathcal{H}_2}(r|\mathcal{H}_2) = f_N * f_S = \int_0^r f_N(\rho) f_S(r-\rho) d\rho \quad (1)$$

$$= \int_0^r b e^{-b\rho} \cdot a e^{-a(r-\rho)} d\rho \quad (2)$$

$$= ba \int_0^r e^{-(b-a)\rho - ar} d\rho \quad (3)$$

$$= bae^{-ar} \int_0^r e^{-(b-a)\rho} d\rho \quad (4)$$

$$= bae^{-ar} \left[-\frac{1}{b-a} e^{-(b-a)\rho} \Big|_{\rho=0}^r \right] \quad (5)$$

$$= -\frac{bae^{-ar}}{b-a} \left[e^{-(b-a)r} - 1 \right] \quad (6)$$

$$= \frac{ba}{b-a} \left[e^{-ar} - e^{-br} \right] \quad (7)$$

$$(8)$$

3 Theorems & proofs

Definition 1 Let H be a subgroup of a group G . A left coset of H in G is a subset of G that is of the form xH , where $x \in G$ and $xH = \{xh : h \in H\}$. Similarly a right coset of H in G is a subset of G that is of the form Hx , where $Hx = \{hx : h \in H\}$

Definition 2 Let H be a subgroup of a group G . A left coset of H in G is a subset of G that is of the form xH , where $x \in G$ and $xH = \{xh : h \in H\}$. Similarly a right coset of H in G is a subset of G that is of the form Hx , where $Hx = \{hx : h \in H\}$

Note that a subgroup H of a group G is itself a left coset of H in G .

Lemma 1 Let H be a subgroup of a group G , and let x and y be elements of G . Suppose that $xH \cap yH$ is non-empty. Then $xH = yH$.

Proof Let z be some element of $xH \cap yH$. Then $z = xa$ for some $a \in H$, and $z = yb$ for some $b \in H$. If h is any element of H then $ah \in H$ and $a^{-1}h \in H$, since H is a subgroup of G . But $zh = x(ah)$ and $xh = z(a^{-1}h)$ for all $h \in H$. Therefore $zH \subset xH$ and $xH \subset zH$, and thus $xH = zH$. Similarly $yH = zH$, and thus $xH = yH$, as required.

Lemma 2 Let H be a finite subgroup of a group G . Then each left coset of H in G has the same number of elements as H .

Proof Let $H = \{h_1, h_2, \dots, h_m\}$, where h_1, h_2, \dots, h_m are distinct, and let x be an element of G . Then the left coset xH consists of the elements xh_j for $j = 1, 2, \dots, m$. Suppose that j and k are integers between 1 and m for which $xh_j = xh_k$. Then $h_j = x^{-1}(xh_j) = x^{-1}(xh_k) = h_k$, and thus $j = k$, since h_1, h_2, \dots, h_m are distinct. It follows that the elements xh_1, xh_2, \dots, xh_m are distinct. We conclude that the subgroup H and the left coset xH both have m elements, as required. ■

Theorem 1 (Lagrange's Theorem) Let G be a finite group, and let H be a subgroup of G . Then the order of H divides the order of G .

Proof Each element x of G belongs to at least one left coset of H in G (namely the coset xH), and no element can belong to two distinct left cosets of H in G (see Lemma 1). Therefore every element of G belongs to exactly one left coset of H . Moreover each left coset of H contains $|H|$ elements (Lemma 2). Therefore $|G| = n|H|$, where n is the number of left cosets of H in G . The result follows. ■

Theorem 2 (Lagrange's Theorem) Let G be a finite group, and let H be a subgroup of G . Then the order of H divides the order of G .

4 Inserting Figures and Tables

In Figure 4 I show a decision region for a recognition problem.

Figure 1: Decision regions for the recognition problem in the $S - T$ plane

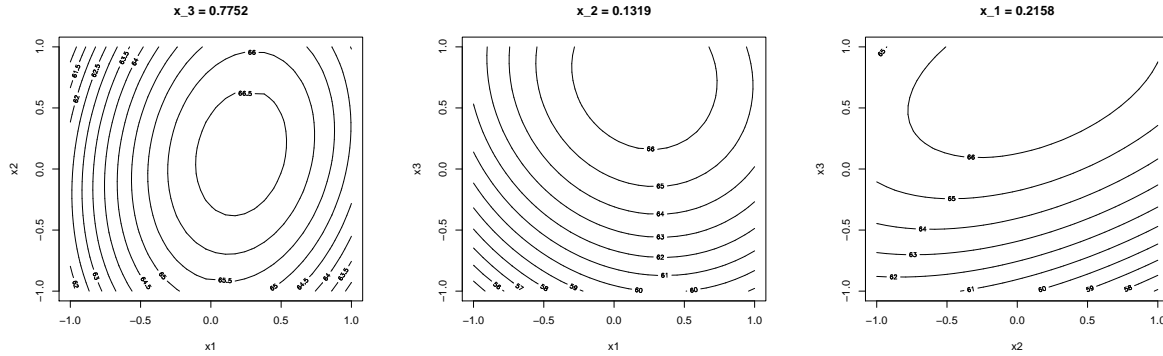


Figure 2: Pairwise contour plots of the response surface with the third variable set at its value in the stationary point

4.1 An Array of Figures

4.2 Data Tables: Tabular

I find the tabular environment to be helpful when I want to line up a bunch of data in a table and have careful control over the alignment of individual columns and where lines are placed relative to the cells. An example of this is in Table 2.

Schedulers		
Immediate	RR	Round Robin
	EF	Earliest First
	LL	Lightest Loaded
Batch	MM	Min-Min
	MX	Max-Min
	DL	Dynamic Level
	RC	Relative Cost
Evolutionary	PN	This paper
	ZO	Genetic Algorithm
	TA	Tabu search [?]
	SA	Simulated Annealing

References

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- [2] Lisanne Bainbridge. Ironies of automation. *Automatica*, 19(6):775–779, 1983.
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Table 1: Exchange rate

Country	GDP (pc)	Exchange rate
Australia	US\$30,666	\$0.96
Burma	US\$2,029	\$0.16
New Zealand	US\$26,725	\$0.78

Table 2: Ranking

Pair k	$a_{k,1}$	$a_{k,2}$	$v(a_{k,1}, a_{k,2})$	Direct Ranking	Ranking with v	$b_{k,1}$	$b_{k,2}$	$v(b_{k,1}, b_{k,2})$
1	10	4	0.39153	↘	↘	45	10	0.79159
2	50	6	0.72223	↘	↘	60	25	0.90443
3	20	6	0.57132	↘	↘	80	13	0.92496
4	30	12	0.74108	↗	↗	70	4	0.69144
5	5	15	0.43278	↗	↘	20	3	0.44843
6	2	5	0.16634	↘	↘	4	15	0.39173
7	70	20	0.9278	↗	↗	5	5	0.316
8	80	20	0.95224	↗	↗	10	8	0.49909
9	45	11	0.8038	↗	↗	10	4	0.39153
10	7	6	0.39774	↘	↘	35	12	0.76866
11	15	4	0.45419	↘	↘	40	18	0.8215
12	15	6	0.52386	↘	↘	50	13	0.84046
13	15	8	0.56891	↘	↘	15	20	0.64535
14	15	10	0.59805	↗	↗	17	5	0.51286
15	15	15	0.63345	↗	↗	3	25	0.35049
16	20	3	0.44843	↘	↘	25	12	0.70844
17	35	20	0.80083	↘	↘	40	25	0.8299
18	90	20	0.97381	↗	↗	30	15	0.7594
19	70	10	0.86931	↗	↗	20	4	0.49857
20	60	7	0.78251	↗	↗	15	7	0.54883

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