math.tex

a short guide

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version 0.1

Functions

- Use \fn to write function applications and not to worry about parantheses.
    - \fn[\max]{x,0} produces

    $$\max{(x, 0)}$$

    - \fn{\fn[g]{\fn[h]{x^2 + 1}^2}^{-1} - 1} produces

    $$f\left(g\left(h\left(x^2 + 1\right)^2\right)^{-1} - 1\right)$$

- Define new functions on top of \fn for nicer equations.

    \newcommand{\foo}[1]{\fn[foo]{#1}}

    \foo{x + 1}

Partial derivatives

- Use \fstpd and \fstpdfn to write first order partial derivatives.
  - \fstpd{f}{x} produces

    $$\frac{\partial f}{\partial x}$$

  - \fstpdfn{\fn[\sin]{2x + 1}^2 +3}{x} produces

    $$\frac{\partial}{\partial x} \left(\sin \left(2x + 1 \right)^2 + 3 \right)$$

- Similarly, use \sndpd and \sndpdfn for second order partial derivatives.

  $$\frac{\partial^2 f \left(x, y \right)}{\partial x \partial y} = \frac{\partial^2}{\partial x \partial y} \left(x^2 + 2y \right)$$

Some useful operators

- Use \argmax{var} for the argmax operator. \argmin exists as well.

$$\underset{\lambda}{\arg\max} \, f\left(\lambda\right)$$

- Both \argmin and \argmax take an optional argument intended to insert the needed space aftet the oprator. The default is \;, but you can provide whatever you feel appropriate.
  - \argmin[]{\alpha} \fn{\alpha} produces

    $$\underset{\alpha}{\arg\min} f\left(\alpha\right)$$

  - \argmin[\quad]{\alpha} \fn{\alpha} produces

    $$\underset{\alpha}{\arg\min} \quad f\left(\alpha\right)$$

Expected values

- Use \expval for the usual way of writing expected values.
  - Write \expval[{x \sim \fn[p]{x}}]{\fn[g]{x}} to produce [1]:

$$\mathbb{E}_{x \sim p(x)} \left[g\left(x \right) \right]$$

  - or, simply \expval{\fn{x}} to produce:

$$\mathbb{E} \left[f\left(x \right) \right]$$

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[1] Yes, this is the correct way to provide optional arguments in LaTeX: [{...}]

Matrix operations

- Use \tr to transpose matrices (it uses the \intercal symbol).
    - \tr{A} produces $A^\intercal$.
- Use \inv to refer to the inverse of a matrix.
    - \inv{A} produces A^{-1}.

Parentheses and brackets

- Use \rp for round parentheses around some expression. Do that if you prefer this to writing \left(... \right) yourself.