math.tex

a short guide

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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.

$$\underset{\lambda}{\operatorname{argmax}} f\left(\lambda\right)$$

- 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

$$\underset{\alpha}{\operatorname{argmin}} f\left(\alpha\right)$$

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

$$\underset{\alpha}{\operatorname{argmin}} \quad f\left(\alpha\right)$$

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.