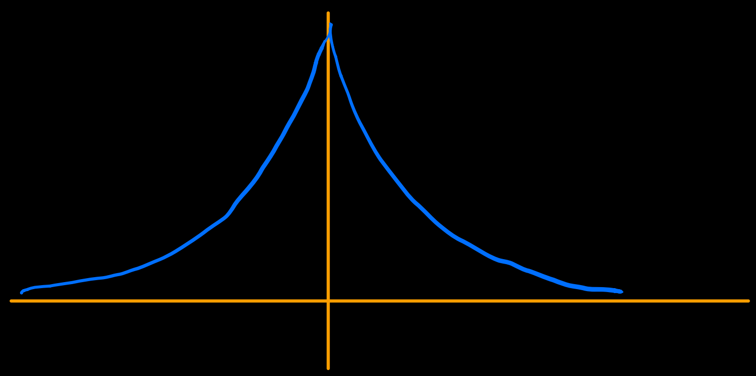
Laplace Dist^n

- also known as double exp dist^n
- looks like 2 exp glued together back to back



can be centred around zero or o.w.

↳ has 2 param

$\boxed{\mu \text{ - centre} \quad b \text{ - flatness (thicker is flatter)}}$

more below

Char: say $X \sim \text{Laplace}(\mu, b)$

w/ pdf $f(x \mid \mu, b) = \frac{1}{2b} \exp\left\{-\frac{|x-\mu|}{b}\right\}$ ← can be written peicewise too

has its 1° deriv!

where μ is locat^n param

b is diversity param

* The support is $\mathbb{R}$
* fatter tail than normal dist^n.
* special case: $\mu = 0$, $b = 1$ $\Rightarrow X \sim \exp\left(\frac{1}{2}\right)$
* has closed form cdf that has closed form inverse

Sampling

1. Generate $u \sim \text{Unif}\left[-\frac{1}{2}, \frac{1}{2}\right]$

   Apply tranform $X = \mu - b \,\text{sgn}(u) \log(1 - 2|u|)$

   $\Rightarrow X \sim \text{Laplace}(\mu, b)$

2. Generate $X, Y \overset{iid}{\sim} \exp\left(\frac{1}{b}\right)$

$$\Rightarrow X - Y \sim \text{Laplace}(0, b)$$

note: this is centred at zero always.

note: inversion of param relative to $\exp(\cdot)$

LASSO - some add't^nal notes.

- does some var. select^n by penalizing for use of many features when predicting $\rightarrow$ effectively zero out some β_i.
  ↳ forces a simpler model.
- classical approach - Least Sqr.

$$\min_{\beta \in \mathbb{R}^p} \left\{ \frac{1}{N} \| y - X\beta \|_2^2 \right\} \text{ subject to } \|\beta\|_1 \le t$$

And via the Lagrangian mult.

$$\min_{\beta \in \mathbb{R}^p} \left\{ \frac{1}{N} \| y - X\beta \|_2^2 + \lambda \|\beta\|_1 \right\}$$ where rel. btwn λ & t is data dependent.

$$\sum_{j=1}^{p} |\beta_j|$$