1.4 $\Rightarrow$ elements of $X$ are $o(\sqrt{n})$! need to check this.

$$\int y^k e^{-y^2/2\sigma^2}$$

$u = y^{k-1}$ | $v = -2\sigma^2 e^{-y^2/2\sigma^2}$

$du = (k-1) y^{k-2}$ | $dv = y e^{-y^2/2}$

$$\int e^{-y^2/2\sigma^2} dy$$

minuses cancel

$$= \left[ -2\sigma^2 y^{k-1} e^{-y^2/2\sigma^2} \right]_v^\infty + 2\sigma^2(k-1) \int y^{k-2} e^{-y^2/2\sigma^2} dy$$

$$\int y e^{-y^2/2\sigma^2} \propto e^{-y^2/2\sigma^2}$$

$$\int c e^{-y^2/2\sigma^2} \propto \boxed{\text{is the one missing}}$$

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$\max_{i \le n} \frac{\|x_i\|}{\sqrt{n}} \to 0$?

$$(y^{k-2}) e^{-y^2/2} + \cancel{\text{constant}}\ C\Phi$$

$\frac{\|x_i\|^2}{n} \to 0$

$\frac{1}{n} X^T X = \frac{1}{n} \sum x_i x_i^T \to V \Rightarrow \frac{\|x_i\|}{\sqrt{n}} \to 0$

$\Rightarrow \frac{1}{n} \mathrm{tr}(\ \frac{1}{n} \sum \|x_i\|^2 \Rightarrow \mathrm{tr}(V)$