$$y = f(x) = \frac{1}{b-a}$$

$$\mu = E(x) = \int_{-\infty}^{+\infty} x f(x)\,\mathrm{d}\,x =$$

$$= \int_a^b \frac{x}{b-a}\mathrm{d}\,x = \frac{1}{b-a}\int_a^b x\,\mathrm{d}\,x = \frac{1}{b-a}\left[\frac{x^2}{2}\right]_a^b =$$

$$= \frac{1}{2}\frac{1}{b-a}\left(b^2 - a^2\right) = \frac{1}{2}\frac{(b+a)(b-a)}{b-a}$$

$$\boxed{\mu = \frac{a+b}{2}}$$

$$\sigma^2 = E\left[(x-\mu)^2\right] = \int_{-\infty}^{+\infty}(x-\mu)^2 f(x)\,\mathrm{d}\,x =$$

$$= \int_a^b \frac{\left(x - \frac{a+b}{2}\right)^2}{b-a}\mathrm{d}\,x$$

Let $u = x - \frac{a+b}{2}$.

$$\sigma^2 = \frac{1}{b-a}\int_{-(b-a)/2}^{(b-a)/2} u^2\,\mathrm{d}\,u = \frac{1}{b-a}\left[\frac{u^3}{3}\right]_{-(b-a)/2}^{(b-a)/2} =$$

$$= \frac{1}{3}\frac{1}{b-a}\left[\left(\frac{b-a}{2}\right)^3 + \left(\frac{b-a}{2}\right)^3\right] = \frac{1}{3}\frac{1}{b-a}\frac{2}{8}(b-a)^3 =$$

$$= \frac{1}{12}(b-a)^2$$

$$\boxed{\sigma = \frac{b-a}{\sqrt{12}}}$$

Physical dimensions match, as expected !

❖