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Q3 (i)

$$\int_{-\infty}^{\infty} f(x)\,dx + \int_{-\infty}^{\infty} a\sin(2\pi \log x) f(x)\,dx$$

$$= 1 + 0 = \boxed{1}$$

because sin is an odd function ($\sin(-x) = -\sin(x)$)

For k^{th} moment of f_a equals:

$$\int_{-\infty}^{\infty} x^k f_a(x)$$

$$= \int_{-\infty}^{\infty} x^k f(x)\,dx + \underbrace{\int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} a\sin(2\pi y) e^{ky - \frac{1}{2}y^2}\,dy}_{= 0}$$

because sin is odd

$$= \int_{-\infty}^{\infty} x^k f(x)\,dx$$

↓

Same moments as Log-distribution