A26 Vest

$$f_X(x) := \begin{cases} 1 - \frac{x}{2} & \text{für } 0 \leq x \leq 2 \\ 0 & \text{sonst} \end{cases}$$

$f_X(1) = 0$

$$P(X \geq 1) = \int_1^2 1 - \frac{x}{2}\, dx = 1 - \frac{1}{2} \int_1^2 x\, dx = 1 - \frac{1}{2} \cdot \frac{2^2 - 1^2}{2}$$

$$= \frac{1}{4}$$

$$P(0{,}5 \leq X \leq 1{,}5) = \int_{0{,}5}^{1{,}5} 1 - \frac{x}{2}\, dx = 1 - \frac{1}{2} \int_{0{,}5}^{1{,}5} x\, dx = 1 - \frac{1}{2} \cdot \frac{1{,}5^2 - 0{,}5^2}{2}$$

$$= \frac{1}{2}$$

$$E(X) = \int_0^2 x \cdot \left(1 - \frac{x}{2}\right) dx = \int_0^2 x - \frac{x^2}{2}\, dx = \int_0^2 x - \frac{1}{2} \int_0^2 x^2$$

$$= \frac{2^2 - 0^2}{2} - \frac{1}{2} \cdot \frac{2^3 - 0^3}{3} = 2 - \frac{1}{2} \cdot \frac{8}{3} = 2 - \frac{8}{6} = \frac{2}{3}$$

$$Var(X) = E(X^2) - E(X)^2$$

$$E(X^2) = \int_0^2 x^2 \cdot \left(1 - \frac{x}{2}\right) dx = \int_0^2 x^2\, dx - \frac{1}{2} \int_0^2 x^3\, dx = \frac{8}{3} - \frac{1}{2} \cdot \frac{2^4 - 0^4}{4}$$

$$= \frac{8}{3} - \frac{1}{2} \cdot 4 = \frac{8}{3} - \frac{6}{3} = \frac{2}{3}$$

$$Var(X) \Rightarrow \frac{6}{9} - \frac{4}{9} = \frac{2}{9}$$