✓

Variance of a continuous random variable

$\mathrm{Var}(X) = E\left[(X-\mu)^2\right]$ — ①

$E(X) = \int_{-\infty}^{+\infty} x f(x)\, dx$ — ②

$\underline{\mathrm{Var}(X) = E(X^2) - \left[E(X)\right]^2}$ — ③

From ① we have

$$\begin{aligned}
\mathrm{Var}(X) &= E\left[(X-\mu)^2\right] \\
&= E\left[X^2 + \mu^2 - 2\mu X\right] \\
&= E(X^2) + E(\mu^2) - 2\,E(\mu)\,\underline{E(X)} \\
&= E(X^2) + \mu^2 - 2\,\mu\cdot\mu \\
&= E(X^2) + \mu^2 - 2\,\mu^2 \\
&= E(X^2) - \mu^2 \\
&= E(X^2) - \left[E(X)\right]^2
\end{aligned}$$