Tutorial 2

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1 Exercise 1

1.1 a)

$$
\begin{aligned}
< (x - \mu)^2 > &= < x^2 - 2x\mu + \mu^2 > \\
&= < x^2 > - < 2x\mu > + < \mu^2 > \\
&= < x^2 > - 2 < x > \mu + \mu^2 \\
&= < x^2 > - 2\mu\mu + \mu^2 \\
&= < x^2 > - \mu^2
\end{aligned}
\tag{1}
$$

1.2 b)

$$
\begin{aligned}
E(x) &= \int_{-\infty}^{\infty} x \frac{1}{b-a} dx \\
&= \frac{1}{2} \frac{1}{b-a} [x^2]_a^b \\
&= \frac{1}{2} \frac{b^2 - a^2}{b-a} \\
&= \frac{1}{2}(b+a)
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
Var(x) &= E(x^2) - E(x)^2 \\
&= \int_{-\infty}^{\infty} x^2 \frac{1}{b-a} dx - E(x)^2 \\
&= \frac{1}{3} \frac{1}{b-a} [x^3]_a^b - E(x)^2 \\
&= \frac{1}{3} \frac{b^3 - a^3}{b-a} - (\frac{1}{2}(b+a))^2 \\
&= \frac{1}{12}(4b^2 + 4ab + 4a^2 - 3a^2 - 6ab - 3b^2) \\
&= \frac{1}{12}(b-a)^2
\end{aligned}
\tag{3}
$$