Lab 3

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Question 1.

    a. Define $s^2 = \frac{1}{n}\sum(x_i - \bar{x})^2$.

$$
\sum_{i=1}^{n}(x_i - \mu)^2 =
$$
$$
\sum_{i=1}^{n}(x_i^2 - 2\mu x_i + \mu^2) =
$$
$$
\sum_{i=1}^{n}x_i^2 - 2\mu\sum_{i=1}^{n}x_i + n\mu^2 =
$$
$$
\sum_{i=1}^{n}x_i^2 - 2\bar{x}\sum_{i=1}^{n}x_i + n\bar{x}^2 + n\bar{x}^2 - 2\mu\sum_{i=1}^{n}x_i + n\mu^2 =
$$
$$
\sum_{i=1}^{n}(x_i^2 - 2\bar{x}x_i + \bar{x}^2) + n(\bar{x}^2 - 2\mu\bar{x} + \mu^2) =
$$
$$
\sum_{i=1}^{n}(x_i - \bar{x})^2 + n(\bar{x} - \mu)^2 =
$$
$$
ns^2 + n(\bar{x} - \mu)^2
$$

$$(1)$$

    b.

    c.

    d.

    e.

    f.

    g.

Consulted the following resource in working on this exercise: https://www.cs.ubc.ca/~murphyk/Papers/bayesGauss.pdf