Solution to Homework 15

Question. If we know that the accuracy of x_1 described by standard deviation $\sigma_1 = 0.3$, and the accuracy of x_2 is described by standard deviation $\sigma_2 = 0.2$, what is the accuracy of $y = x_1 + 2x_2$?

Answer. In general, for a linear combination $y = \sum c_i \cdot x_i$, the standard deviation is equal to $\sigma = \sqrt{\sum c_i^2 \cdot \sigma_i^2}$. In our case, $c_1 = 1$ and $c_2 = 2$, so:

$$\sigma = \sqrt{c_1^2 \cdot \sigma_1^2 + c_2^2 \cdot \sigma_2^2} = \sqrt{1^2 \cdot 0.3^2 + 2^2 \cdot 0.2^2} =$$

$$\sqrt{1 \cdot 0.09 + 4 \cdot 0.04} = \sqrt{0.09 + 0.16} = \sqrt{0.25} = 0.5.$$