Homework (Linear Combination of Normal Distributions)
Prob. and Stat. for Eng. (STAT:2020; Bognar)

1. Suppose X_1, X_2, and X_3 are independent random variables where

$$X_1 \sim N(\mu_1 = 1, \sigma_1^2 = 1^2)$$
$$X_2 \sim N(\mu_2 = 2, \sigma_2^2 = 2^2)$$
$$X_3 \sim N(\mu_3 = 3, \sigma_3^2 = 3^2)$$

   (a) Let $W = X_1 - X_2$. What is the distribution of W? Be sure to state all parameters. *Show your work using clear notation.*

   (b) Using your answer in (1a), find $P(X_1 > X_2)$. *Show your work using clear notation.*

   (c) Let $W = X_1 - 6X_2 + 2X_3$. What is the distribution of W? Be sure to state all parameters. *Show your work using clear notation.*

   (d) Using your answer in (1c), find $P(X_1 - 6X_2 > 5 - 2X_3)$. *Show your work using clear notation.*