Homework Assignment No. 8, due Monday, 4/10 at 5 pm

1. Use the Lagrange function in Eq.(8.13) from the lecture notes to show that the minimum is achieved at
$$\lambda_1 = \frac{C - \mu B}{AC - B^2}, \quad \lambda_2 = \frac{\mu A - B}{AC - B^2},$$
and derive the minimum-variance portfolio weight vector given in Eq.(8.14). Here A, B and C are defined on page 4 of week 10 notes.

2. Let $a > 0$ and $b \neq 0$. Show that the utility functions $u(x) = ax+b$ and $u(x) = ax - \frac{b}{2}x^2$, where $x < \frac{a}{b}$, obey
$$\mathbb{E}\left[u(X)\right] = u\left(\mathbb{E}[X]\right) + \frac{1}{2}u''\left(\mathbb{E}[X]\right)\mathrm{Var}(X).$$

3. Assume a risk-free rate of 1.5%. Answer the questions below using the information in the following table:

Table 1: default

Portfolio	A	B	C	D	E	F
Expected Return	3.2%	8.1%	9.8%	5.1%	10.7%	4.8%
Standard Deviation	2.7%	9.9%	13.7%	6.2%	17%	6.1%

   (a) Among the portfolios in the table, which one is closest to the market portfolio? Justify your answer.

   (b) Plot the capital market line (CML) based on your answer in part (a).

   (c) For portfolio C, what is the portfolio risk premium per unit of portfolio risk?

   (d) Suppose we are willing to make an investment only with $\sigma = 6.2\%$. Is a return of 6.5% a realistic expectation for us?