FINM3093 Investments
Solution to Quiz

1. (10 points)
   a. Since the initial margin is 50% and you purchased 1000 shares at $19 per share, you own equity is 500(19) = $9,500 and borrowed $9,500. Assume the price when you received a margin call was P. Equity is (1000P – 9500). The price P can be solved as:

$$\frac{1000P - 9500}{1000P} = 0.3 \Rightarrow \text{when } P = 13.57 \text{ or lower}$$

   b. You buy 100 shares for $6,000. Since the initial margin is 60%, your own equity is 3,6000. You sell the stock at $72 per share, your rate of return will be:

$$\frac{(72 - 60)100}{3600} = 33.33\%$$

2. (3 points) NAV = (200-3)/5 = $39.4

3. (3 points) mean = 0.2/5 = 0.04
   (3 points) variance = (0.06^2 + 0.14^2 + 0.16^2 + 0.36^2 + 0.44^2)/4 = 0.093
   (3 points) std = 0.304959
   (3 points) Sharpe ratio = (0.04-0.05)/0.304959 = -0.03279

4. (25 points)
   a. The covariance between the funds is

$$Cov(r_X, r_Y) = \rho\sigma_X\sigma_Y = -.2(20)(60) = -240.$$

The proportions in the global minimum-variance portfolio are given by

$$w_X = \frac{60^2 - (-240)}{60^2 + 20^2 - 2(-240)} = 0.8571, w_Y = 1 - w_X = 0.1429$$

With these proportions, the expected return and standard deviation of the minimum-variance portfolio are

$$E(r_P) = 0.8571(10) + 0.1429(30) = 12.86\%$$
$$\sigma_{min} = \{(0.8571 \times 20)^2 + (0.1429 \times 60)^2 + 2(0.8571)(0.1429)(-240)\}^{1/2} = 17.57\%$$

Which is less than that of the optimal risky portfolio.

   b. The proportions in the optimal risky portfolio are given by

$$w_X = \frac{(10-5)60^2 - (30-5)(-240)}{(10-5)60^2 + (30-5)20^2 - (10-5+30-5)(-240)} = 0.6818,$$

$$w_Y = 1 - w_X = 0.3182$$

The expected return and standard deviation of the optimal risky portfolio are

$$E(r_P) = 0.6818(10) + 0.3182(30) = 16.36\%$$
$$\sigma_P = \{(0.6818 \times 20)^2 + (0.3182 \times 60)^2 + 2(0.6818)(0.3182)(-240)\}^{1/2} = 21.13\%$$

Note that portfolio *P* has a higher standard deviation than that of the global minimum-variance portfolio.

c. The CAL is the line from the risk-free rate through the optimal risky portfolio. This line represents all efficient portfolios that combine T-bills with the optimal risky portfolio. The slope of the CAL is

$$S = \frac{E(r_P) - r_f}{\sigma_P} = \frac{16.36 - 5}{21.13} = 0.5376$$

d. Given a degree of risk aversion, *A*, an investor will choose the following proportion, *y*, in the optimal risky portfolio (remember to express returns as decimals when using *A*):

$$y = \frac{E(r_P) - r_f}{A\sigma_P^2} = \frac{.1636 - .05}{3(.2113^2)} = 0.8481$$

This means that the optimal risky portfolio, with the given data, is attractive enough for an investor with *A* = 3 to invest 84.81% of his or her wealth in it. Because stock *X* makes up 68.18% of the risky portfolio and stock *Y* makes up 31.82%, the investment proportions for this investor are

Stock *X*:	.8481(68.18) = 57.82%
Stock *Y*:	.8481(31.82) = 26.99%
Total	15.19%