3.1. Fully-leveraged portfolios.

**Problem 3.1.** (5 points) Write down the definition of a fully-leveraged portfolio.

3.2. Long/short positions.

**Problem 3.2.** (5 points) Complete the following definition:

A function $f : [0, \infty) \rightarrow \mathbb{R}$ is said to be nonincreasing/decreasing if

**Problem 3.3.** (5 points) Complete the following definition:

A function $f : [0, \infty) \rightarrow \mathbb{R}$ is said to be nondecreasing/increasing if

**Problem 3.4.** (5 points) Complete the following definition:

A financial portfolio is said to be long with respect to an underlying asset if

**Problem 3.5.** (5 points) Complete the following definition:

A financial portfolio is said to be short with respect to an underlying asset if

3.3. European call options.

**Problem 3.6.** (10 points) *Source: Sample FM(DM), Problem#11*

The current stock price is $40, and the effective annual interest rate is 8%.

You observe the following option prices:

1. The premium for a $35-strike, 1-year European call option is $9.12.
2. The premium for a $40-strike, 1-year European call option is $6.22.
3. The premium for a $45-strike, 1-year European call option is $4.08.

Assuming that all call positions being compared are long, at what 1-year stock price range does the $45-strike call produce a higher profit than the $40-strike call, but a lower profit than the $35-strike call? Express your answer as an interval.

**Problem 3.7.** (5 points) A stock’s price today is $1000 and the annual effective interest rate is given to be 5%. You write a one-year, $1,050-strike call option for a premium of $10 while you simultaneously buy the stock. What is your profit if the stock’s spot price in one year equals $1,200?

**Problem 3.8.** (5 points) The price of gold in half a year is modeled to be equally likely to equal any of the following prices $1000, \hspace{1em} 1100, \hspace{1em} \text{and} \hspace{1em} 1240$

Consider a half-year, $1050-strike European call option on gold. What is the expected payoff of this option according to the above model?
3.4. **European put options.** Provide your **final answer** only for the following problems:

**Problem 3.9.** (2 points) In which of the following option positions is the investor exposed to an unlimited loss?

(a) Long put option  
(b) Short put option  
(c) Long call option  
(d) Short call option  
(e) None of the above.

**Problem 3.10.** (3 points) The initial price of the market index is $1000. After 3 months the market index is priced at $950. The nominal rate of interest convertible quarterly is 4.0%.  
The premium on the long put, with a strike price of $975, is $10.00. What is the profit at expiration for this long put?

(a) $12.00 loss  
(b) $14.90 loss  
(c) $12.00 gain  
(d) $14.90 gain  
(e) None of the above.