Name:

M339D/M389D Introduction to Financial Mathematics for Actuaries
University of Texas at Austin
Practice for $\Delta-$hedging.
Instructor: Milica Čudina

Notes: This is a closed book and closed notes exam. The maximum number of points on this exam is 100.
Time: 50 minutes

1.1. **Free-response problems.** Please, explain carefully all your statements and assumptions. Numerical results or single-word answers without an explanation (even if they're correct) are worth 0 points.

Problem 1.1. (10 points) Assume the Black-Scholes framework.

The goal is to delta-hedge a written one-year, $(40, 60)$-strangle on a non-dividend-paying stock whose current price is \$50. The stock's volatility is 0.20.

The continuously compounded, risk-free interest rate is 0.10.

What is the cost of delta-hedging the strangle using shares of the underlying stock?

Problem 1.2. (2 points) Let $K_1 < K_2$. A call bull spread consists of a long K_1-strike call and a short K_2-strike call. The options are otherwise identical and European.

An investor wants to delta-hedge a bull spread she bought. Then, she should short-sell shares of the underlying asset. *True or false? Why?*

Problem 1.3. (2 points) A market-maker writes a call option on a stock. To decrease the delta of this position, (s)he can **write** a call on the underlying stock. *True or false?*

Problem 1.4. (2 points) Consider an option whose payoff function is given by $v(s, T) = \min(s, 50)$. If a market-maker **writes** this option, they need to short sell shares of stock to create a delta-neutral portfolio. *True or false? Why?*