Math 458 - Practice Problems for Quiz # 3

- 1. Please circle either T (true) or F (false) for each of the below statements. All prices are no-arbitrage prices.
 - A) T F $\theta_{\text{call}} = -\theta_{\text{put}}.$
 - B) T F The "Greek" Vega (\mathcal{V}) for a call is the rate of change of C^E with respect to the continuous dividend rate δ .
 - C) T F For a non-dividend paying stock, $\Delta_C \Delta_P = 1$.
 - D) T F θ from class is the negative of θ from the book.
- 2. For a 1-year European call option on a stock, you are given that the stock's price is 45, it pays continuous dividends proportional to its price at a rate of 2%, the stock's annual volatility is 10%, and the continuously compounded risk-free interest rate is 4%. If using the BSM framework $\Delta = 0.5$, what is the strike price?
 - A) 45
 - B) 46.02
 - C) 47.53
 - D) 48.79
 - E) 50.03
- 3. A call option on MSU stock has a Δ of 0.45, and a put option on MSU stock with the same strike and expiration has a Δ of -0.55. The stock is currently trading for \$48. The gamma for both the call and the put is 0.07. What is the approximate value of Δ of the put if the stock price suddenly decreases by \$0.50?
- 4. For CRUNCHY'S (CRN) stock,
 - the current stock price is \$54;
 - the volatility relevant for the BSM framework is 30%;
 - the stock pays no dividends;
 - the annual continuously compounded risk-free interest rate is 4%.

Find θ_{Π} for a portfolio Π that consists of a 1-year bull-spread on CRN consisting of 50- and 60-strike calls.

5. Let $\Delta = 1/2$ for a 1-year European call option on a non-dividend paying stock. If the continuous annual risk-free rate is 4% and the current stock price is 90% the value of the strike price, find C^E/K .

6. You are given the following information for two European options on a stock priced using the Black-Scholes formula:

	45-strike put	50-strike call
Price	0.0211	10.2270
Δ	-0.0082	0.9300
Γ	0.0030	0.0160

The stock price is 60. Determine the number of shares of stock and the number of 50-strike calls one must buy or sell to Δ - Γ hedge a sale of a 45-strike put.

- 7. For a 6-month at-the-money European put option on a stock, you are given that the stock pays continuous dividends at an annual rate of $\delta = 4\%$ that is equal to the risk-free rate. Within the BSM framework, you also know that $\Delta = -0.45$. Find the annual volatility of the stock.
- 8. As a market-maker, you write a 91-day, 50-strike put option on a non-dividend paying stock and then Δ -hedge it. You know
 - The underlying stock price is 50.
 - The stock's continuous annual volatility is 20%.
 - The continuously compounded risk-free interest rate is 8%.
 - The option is priced using the BSM framework.

Find the overnight profit on your position if the stock price does not change.