Problem 2.1. (2 points) A zero-width, zero-cost collar can be created by setting both the put and call strike prices at the forward price.

Problem 2.2. (2 points) You believe that the volatility of a stock is higher than indicated by market prices for options on that stock. You want to speculate on that belief by buying and/or selling at-the-money options. You should buy a strangle.

Problem 2.3. (2 points) A butterfly spread can be constructed in this way:

\[ \text{Buy a 90 put, sell a 100 put, sell a 100 call, buy a 110 call.} \]

Problem 2.4. (2 points) A box spread is a replicating portfolio for a bond.

Problem 2.5. (2 points) The payoff function of a ratio spread is never bounded from above.

Problem 2.6. (5 points) We are given the following European-call prices for options on the same underlying asset:

\[
\begin{align*}
\text{Strike} & & \text{Price} \\
$50 & & $11 \\
$55 & & $6 \\
$60 & & $4
\end{align*}
\]

Assume that the continuously compounded interest rate is strictly positive. Which of the following portfolios would exploit an arbitrage opportunity stemming from the above stock prices?

(a) The call bull spread only. 
(b) The call bear spread only. 
(c) Both the call bull and the call bear spread. 
(d) Neither the call bull or call bear spread, but there is an arbitrage opportunity. 
(e) There is no apparent arbitrage opportunity. 

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