Financial Derivatives
Solutions

Question 1

Choice "a" is correct. A call option allows the buyer to buy the underlying stock at a specified price. Therefore, if the stock price appreciates significantly, the call option holder has the right to buy the stock at the pre-determined, lower price (strike price).

Choice "b" is incorrect. If the stock price falls significantly, the call value will fall to zero, as there is no value in the ability to buy the stock at a higher price than the trading price at in the market.

Choice "c" is incorrect. Call options increase in value with an increase in volatility and with upward movement in the stock price. Therefore, an unchanged asset price does not benefit the holder of the call option.

Choice "d" is incorrect. A call option is in-the-money (for the buyer) when the stock price exceeds the strike (exercise) price. The option's status as either in-the-money or out-of-the-money would be a product of the movement in the stock price. In this case, a large increase in the stock price would result in the option being in-the-money and would benefit the buyer of the call option. At the option position inception, the option can be in the money or out of the money.

Question 2

Choice "c" is correct. Unlike a futures contract, both the buyer and the seller of a forward contract are exposed to illiquidity and default risk. Forwards contracts tend to be illiquid because the terms of the contract itself are usually designed to meet the specific needs of the contracting parties, so it is difficult for either side to close out only their one side of the contract. Credit default risk exists because the forward agreement is often based solely on trust, which exposes each party to the risk that the counterparty might default on its obligation.

Choice "a" is incorrect. Money does not change hands at the initiation of the forward contract. The cash settlement or physical delivery takes place at the expiration of the contract term.

Choice "b" is incorrect. Forward contract, unlike futures contracts, are not traded on an exchange. They are traded over the counter.

Choice "d" is incorrect. Forward contracts are not marked on a daily basis. That is a defining characteristic of future contracts.

Question 3

Choice "c" is correct. Counterparties must post margin in a futures trade. The margin is adjusted daily through the mark-to market process.

The initial margin is the amount that must be posted prior to executing the contract. Maintenance margin is the minimum level below which the margin account is not permitted to fall without a margin call. Variation margin will be required once a margin call is issued, and it represents the amount that will bring the margin account back up to the initial margin level.

Choice "a" is incorrect. Future contracts are not traded over-the-counter. They are traded on organized futures exchanges.

Choice "b" is incorrect. Contract terms for futures contracts are standardized. Notional contract amount, the specific asset and expiration are all defined in the contract as standard inputs. Forward contracts have terms that are unique to the needs of the individual counterparties.

Choice "d" is incorrect. With futures contracts, marking to market is not an option…it is a requirement, enforced by the clearinghouse through the daily settlement of all gains and losses.

Question 4

Choice "c" is correct. An arbitrage opportunity is defined as the ability to make a riskless profit without requirement any net investment. Because derivative contracts trade in a different marketplace than the assets that underlie them, arbitrage opportunities do exist. However, they are quickly exploited and thus short-lived.

Choice "a" is incorrect. An arbitrage opportunity is designed to make a profit. However, the strategy would have no risk attached.

Choice "b" is incorrect. In an "efficient" market, arbitrage opportunities would not exist because the price of any financial asset would be rational or in equilibrium. In an "inefficient" market, arbitrage opportunities are available.

Choice "d" is incorrect. The law of One Price (the no-arbitrage principal) dictates that the price of any financial asset must be rational and thus, non arbitrageable. In this scenario, the prices of derivative instruments would bear a mathematical relationship to the spot prices of their underlying commodities/assets that would not be exploitable by arbitrage opportunities.

Question 5

Choice "a" is correct. Speculation and hedging are two critical purposes that are served by derivatives markets. Price risk is shifted from those who do not want it (hedgers) to those willingly accept it (speculators).

Choice "b" is incorrect. Unlike a cash position, which may impose certain restrictions on short selling, it's very easy to enter into short positions in derivatives.

Choice "c" is incorrect. Short hedges are designed to reduce the risk associated with price changes in assets already owned. Long hedges reduce the risk for assets that ab individual is planning to acquire.

Choice "d" is incorrect. Costs of trading derivatives are low relative to the costs of trading the underlying assets. As a result of low trading costs and high liquidity, derivatives markets are considered to be efficient.

Question 6

Choice "a" is correct. A derivative instrument does derive its value from an underlying commodity, security or index.

Choice "b" is incorrect. In many cases, a party to a derivative contract is trying to reduce their level of risk, not increase it.

Choice "c" is incorrect. A derivative instrument is certainly not riskless.

Choice "d" is incorrect. Futures contracts and options contracts are highly regulated, but swaps and forward contracts are not regulated.

Question 7

Choice "b" is correct. The speculator seeks to earn a profit while the hedger seeks to eliminate or reduce risk.

Choice "a" is incorrect. Whether a speculator may or may not have sufficient cash is irrelevant to their motivation which is to make a profit.

Choice "c" is incorrect. A true hedge hedges both up and down movements in the asset's price.

Choice "d" is incorrect. This refers to an option strategy which is asymmetrical.

Question 8

Choice "d" is correct. A long hedge involves purchasing a futures contract to hedge against a price increase in an asset expected to be bought at a future date.

Choice "a" is incorrect. An arbitrage strategy is one which tries to exploit mis-priced assets to capture a "riskless" profit. This is not the strategy a market participant would use in the situation described in the question.

Choice "b" is incorrect. A short hedge is where futures contracts are sold to prevent losing value if the price of an owned asset decreases before its eventual sale. This is the opposite situation than what is described in the question.

Choice "c" is incorrect. Speculation is the act of taking on risk by investors who do not want to take delivery of the actual asset. The market participant in this case might be entering into a long hedge with a speculator. However, the market participant in the question is not speculating, but hedging.

Question 9

Choice "d" is correct. Both put and call writers (sellers) have an obligation to honor the terms of the option. Option holders (buyers) have the right, not the obligation, to exercise under the terms of the agreement. The holder pays a premium for this right, while writer receives a premium for this obligation.

Choice "a" is incorrect. A forward contract imposes an obligation on both the buyer and seller to honor the terms of the contract.

Choice "b" is incorrect. A call option gives the buyer the right, not the obligation, to buy the underlying security by exercising the option. Choice "c" is incorrect. If the put is exercised, the seller of the put is **obligated** to buy the underlying security from the put holder.

Question 10

The part of the value of an option that is due to its positive time to expiration.

The time value of a call option is always greater than zero in that it gives the buyer the chance to reach higher return in the future, even though in the case of out-of-the money situation.

Question 11

Choice "c" is the correct. Since she expects the underlying stock price to stay the same, she should write (or sell) both options and keep the premiums.

Question 12

a. The maximum profit is infinite

The maximum loss = 1,000 (65 – 67.8) – 3.75 = £ 6,550

b. Breakeven point: £65 + £3.75 = £68.75

Question 13

Choice "a" is correct. The intrinsic value of the call option is: Max (0, S-X) = Max (0, $55 - $51 = $4.00

The time value of the call is: option market price – intrinsic value = $5.25-$4.00 = $1.25

Choice "b" is incorrect. $5.25 is the market price of the option and $4.00 is its intrinsic value.

Choice "c" is incorrect. The numbers are reversed. The time value is $1.25 and the intrinsic value is $4.00.

Choice "d" is incorrect. The intrinsic value is correct, but the time value is $1.25, not the $5.25 option price.

Question 14

Choice "c" is correct. The expiration value of a put option = Max (0, X-S) = Max (0, $30 - $27) = $3.00

Choice "a" is incorrect. $0.00 is the time value of the option at expiration.

Choice "b" is incorrect. $2.50 is the true value of the option less the option cost. The question asks the expiration-day value, not the net profit.

Choice "d" is incorrect. This is the stock's initial price of $31.50 less its closing price of $27.00. However, this does not represent the value of the option at expiration.

Question 15

Choice "a" is correct. Put-Call parity is derived by equating a fiduciary call position ($X/(1+r)^T + C_0$) with a protective put position ($S_0 + P_0$). Since both positions have equivalent payoffs at expiration, they should have the same value today:

$$X/(1+r)^T + C_0 = S_0 + P_0$$

Rearranging terms, we get,

$$S_0 - C_0 = X/(1+r)^T - P_0$$

Choices "b", "c" and "d" cannot be properly rearranged to show put-call parity.

Question 16

Choice "b" is correct. By put-call parity, we have:

$S_0 - C_0 = X/(1+r)^T - P_0$
$\$120 - \$13.90 = \$110 / (1.03)^{0.5} - \$2.29$
$\$106.10 = \$106.10$

The equation holds, so the securities are properly priced.

Choices "a", "c" and "d" are consequently incorrect. If put-call parity did not hold, it does not identify which asset is mispriced – only that the assets are not properly priced in relationship to each other. If the put price looked too low, it could be due to the call price being too high or the stock price being too low.

Question 17

Choice "c" is correct. Put-call parity says:
(protective put) $S_0 + P_0 = X / (1+r)^T + C_0$ (fiduciary call)

Plugging in the values given in the problem and calculating

$X / (1+r)^T = 4 / (1.01)^{0.25} = 3.99$, we have
3.95 + 0.5 = 3.99 + 0.35
4.45 > 4.34
The protective put is relatively more expensive than the fiduciary call. This rule outs choice "b". Sell the former and buy the latter and lock in a profit at expiration. Selling the protective put requires: sell stock and the put. Buying the fiduciary call requires: buy the call and a bond that pay 4.00 in three-months. Choice "a" has the required trades backwards and "d" is not the put-call parity relationship.

Question 18

Choice "b" is correct. The minimum American call value is given by MAX $[0, S_0 – X/(1+r)^T]$. We have S_0 = \$55, X=\$50, r=0.03 and T=0.5. So,

Minimum American call value ≥ Max $[0, 55\text{-}50/(1.03)^{0.5}]$ = Max[0, \$5.73] = **\$5.73**

Choice "a" is incorrect because it discounts the strike price over a full year (50/1.03) rather than six months $[50/(1.03^{0.5}]$, which is the term of the option.
Choice "c" is incorrect because it does not discount the strike price.
Choice "d" is incorrect because the option is clearly in the money, so $S_0\text{-}X/(1+r)^T$ is >0.

Question 19

Choice "b" is correct. The minimum European call option value is given by Max$[0, S_0 – X/)(1+r)^T]$. We have S_0 = \$29.75, X=\$30, r=8% and T=0.75. So,

Minimum European call value ≥ Max $[0, \$29.75\text{-}50/ (1.08)^{0.75}]$ = Max [0, \$1.43] = **\$1.43**

Choice "a" is incorrect because it discounts the strike price over a full year (30/1.08) rather than nine months $[(30/1.08)^{0.75}]$, which is the term of the option.
Choice "c" is incorrect. Even though the option is out-of-the-money, the relatively long time to expiration and high interest gave the call a positive **minimum** value.
Choice "d" is incorrect because an option cannot have negative value.

Question 20

Choice "c" is correct. Normally, longer options are worth more than shorter options all other things equal. However, for European puts, this relationship may not hold. If the price of the underlying asset goes to zero, then the shorter European put may be worth more than the longer European put because the put holder will receive the exercise price earlier and will be able to begin earning interest sooner.

Choice “a” is incorrect. Because the shorter European put would result in earning interest sooner, the longer put may not be worth as much.
Choice “b” is incorrect. This is simply a variation of answer choice “a”.
Choice “d” is incorrect. In most cases, the shorter put is worth less than the longer put.

Question 21

Choice “b” is correct. The minimum European put value is given by Max[0, $X/(1+r)^T - S_0$]. We have S_0 = \$40, X=\$43, r=0.05 and T=0.5. So,

Minimum European put value ≥ Max [0, \$43 / $(1.05)^{0.5}$-\$40] = Max [0, \$1.96] = **\$1.96**

Choice “a” is incorrect because it discounts the strike price over a full year (\$43/1.05) rather than six months (\$43/$(1.05)^{0.5}$, which is the term of the option.
Choice “c” is incorrect because it divides the actual interest rate by 2 for the six month period (\$43/$(1.025)^{0.5}$, rather than keeping the interest rate at 5% (\$43/$(1.05)^{0.5}$).
Choice “d” is incorrect because it ignores the fact that a European option must wait until expiration to exercise.

Question 22

Choice “b” is correct. The minimum American put value is given by Max[0, $X-S_0$]. We have S_0 = \$110, X=\$100, r=0.05 and T=0.5. So,

Minimum American put value ≥ Max [0, \$100-\$110] = Max [0, -\$10] = **\$0**

Choice “a” is incorrect because an option value cannot be negative.
Choice “C” is incorrect because it uses the formula to determine the minimum value of a European put, not an American put. Within the formula, it also switches the strike price and current stock price ((\$110/$(1.03)^{0.5}$)-\$100.
Choice “d” is incorrect because it uses the formula to determine the minimum value of a European call not American put (\$110-(\$100/$(1.03)^{0.5}$)).

Question 23

Choice “c” is correct. Buying a call is one way to get economic exposure to the underlying asset. Another is to directly buy the asset. However, the call purchase requires much less cash outlay than a cash purchase. The cash saved can be placed on deposit at the going interest rate. If rates increase, and the underlying stock price is unchanged, the call becomes more valuable.

Choice “a” is incorrect. In this scenario, a rise in interest rates would cause the value of the call option to increase, not decrease.
Choice “b” is incorrect. The rise in interest rates would be beneficial to the value of a call option, as the money an investor saves by not buying the asset directly can be deposited and earn a higher interest rate.
Choice “d” is incorrect, as the value of a put option tends to decrease as interest rates rise.

Question 24

Choice "b" is correct. Options on Treasury bonds are price-based, not yield-based. The portfolio manager is worried about a rise in interest rates which would produce a decline in **bond prices**. To gain from a decline in prices, the manager should buy put options.

Choice "a" is incorrect because call options on Treasury bonds would perform well if prices rose (or rates fell). The portfolio manager here is concerned with rising interest rates.
Choice "c" would provide some premium income, but not enough to be a good hedge for a sharp fall in bond prices.
Choice "d" would lose money if rates rose, which is an event the manager is trying to hedge against.

Question 25

Choice "c" is correct. Since she expects the underlying stock price to stay the same, she should write (or sell) both options and keep the premiums.

Choice "a" is incorrect. Buying a call means she is expecting the stock price to increase, not stay the same.
Choice "b" is incorrect. Buying a call and selling a put are both long positions, which is what she would do if she expected the underlying stock price to increase.
Choice "d" is incorrect. Buying a put option is appropriate if she expects the underlying stock price to decrease.

Question 26

Choice "c" is correct. When creating a covered call option, the investor sell a call option and buys the underlying stock, thereby "covering" the call, so that if the call option is exercised, the investor can deliver the underlying stock into the call.

Choice "a" is incorrect. In this scenario the investor benefits most from a price decrease. The call option is protection against a price rise. This strategy loses money if the stock price is unchanged or rises, but losses are limited by the presence of the call option.
Choice "b" is incorrect. Here the investor has leveraged the upside potential. By buying a call and selling a put, the investor is betting that the stock price will increase so the call will increase in value and the investor will get to keep the premium from selling the put. This strategy strongly favors rising prices.
Choice "d" is incorrect. Selling a call and buying the underlying stock is creating a covered call position. By buying a put option the investor has created a form of portfolio insurance. No matter which way the stock price moves, the ending value of the portfolio will be the same. If the call and put option have the same strike price and expiration, then from put-call parity this position is equivalent to lending at the risk-free rate.

Question 27

Choice "d" is correct. A portfolio insurance strategy involves buying a put option on an owned stock so that if the stock decreases in value, the put option increases in value, thereby protecting the portfolio against a loss.

Choice "a" is incorrect. This is a covered call strategy. This creates a short position where the investor keeps the premium if the stock price drops, but also loses because he or she owns the stock. The investor still profits if the stock's price increases, but the stock will be called away once it reaches the strike price.
Choice "b" is incorrect. Buying a call does not protect the investor's portfolio if the stock drops because buying a call option creates a long position. So the investor is long the stock and long the call, benefiting only when price increases.
Choice "c" is incorrect. Selling a put creates a long position as the investor hopes the put is never exercised and the premium is earned. Therefore, it provides no downside protection for the portfolio.

Question 28

Choice "d" is correct. The portfolio insurance consists of owning the stock at $40 and buying 10 put contracts at $150 per contract. At expiration, the put contracts will be worth $6.00 each ($41.00-$35.00).

Profit/Loss = Ending Portfolio Value – Net Acquisition Cost
= [1000 shares × $35.00 + 10 × $6.00 × 100] – [100 shares × $40.00 + 10 × $1.50 × 100]
= $ (500)

Initial Portfolio Cost = - 40,000 – 1,500 = -41,500
Ending Portfolio Value = +35,000 + 6,000 = +41,000
= -$500

Choice "a" is incorrect. The expiration value of the put would need to be $1.50 higher to result in a gain of $1,000. This would occur if the strike price was $42.50.
Choice "b" is incorrect. The expiration value of the put would need to be $1.25 higher to result in a gain of $750. This would occur if the strike price was $42.25.
Choice "c" is incorrect. The expiration value of the put would need to be higher ($6.50) to result in no gain/loss.

Question 29

Choice "c" is correct. This is a protective put strategy where the investor buys "insurance" to protect from a large decrease in the stock price. If the stock price does not move, the investor loses the put premium, which is small, relative to the price of the stock.

Choice "a" is incorrect. This is the value that the investor would receive on the put option if the stock price were to fall significantly. If the stock fell, the put option would rise in value and limit the investor's loss from owning the stock.

Choice “b” is incorrect. This is the return the investor could have received if she had sold (written) a call option on the stock to create a covered call. If the investor had sold a covered call, and the stock price had not moved, she would have received the premium from selling the call option, which would have slightly increased her return from the position.
Choice “d” is incorrect. By buying a put option, the investor insures her portfolio and prevents the possibility of having a significantly lower return than she would have received from the stock alone.

Question 30

Choice “d” is correct. If she thinks the underlying index will decline, she should buy a put option on the index. To accentuate the position, she could also sell a call option to earn additional premium income if price falls.

Choice “a” is incorrect. Selling a call will earn the writer of the call the premium, but will not maximize her profit if the stock index falls sharply.
Choice “b” is incorrect. Selling a put and buying a call will lose money if the index falls sharply. First, the put will rise in value and the investor will have to close-out the put at a loss. Second, the call will lose value if the index declines as expected.
Choice “c” is incorrect. The put position will benefit as the index falls, but the call is not a good purchase if the index does fall. Choice “d” is a better way to benefit from the index falling.

Question 31

Choice “d” is correct. Paul loses $800 as the stock declines from $53 to $45. However, Paul gets to keep the $5.50 ($550 total premium) premium from selling the call, as the call expires worthless. The net is a loss of $250.

Choice “a” is incorrect. A loss of $800 only accounts for the loss on the stock.
Choice “b” is incorrect. The $1,350 is a combination of the $800 stock loss plus the $550 option premium, as if it was paid. But, the premium was earned.
Choice “c” is incorrect. A gain of $550 only accounts for the premium collected by selling the call. It does not account for the loss of $800 on the stock itself.

Question 32

Choice “d” is correct. The breakeven price is the sum of the strike price plus the call price: $S_{Breakeven} = X + C = \$20.00+\$2.50 = \$22.50$
The stock has to rise to this price for the buyer of the call to Breakeven at option expiration.

Choice “a” is incorrect. $15 is the stock price minus the option premium. This is not the breakeven price of the naked call option strategy.
Choice “b” is incorrect. This is the price of the stock, not the option breakeven price.
Choice “c” is incorrect. This is the strike price of the option, not the option breakeven price.

Question 33

Choice "a" is correct. Portfolio insurance outperforms a stock only strategy when the stock price falls below the breakeven price of the put. Until the stock price falls that far and becomes in-the-money and covers the premium (X-p, where X is the strike price and p is the cost of the put), the cost of the put adds to the investor's losses.

Choice "b" is incorrect. If the price of the stock does not fall below the breakeven for the put option, the loss from the put increases the loss on the stock.
Choice "c" is incorrect. If the stock price rises, the investor's gain from the increased price of the stock will be reduced by the cost of the put. Thus, the portfolio's total return would be less than that of the stock only.
Choice "d" is incorrect. If the stock price rises, the investor's gain from the increased price of the stock will be reduced by the cost of the put.

Question 34

Choice "c" is correct.
Total cost of acquiring the option is 100 × $2.50 = $250
Value of the call at expiration is $72 - $68 = $4 × 100 = $400
Profit/loss equals the value of the call less the option premium paid: $400 - $250 = $150

Choice "a" is incorrect. This is the profit if the $65 stock price was used incorrectly in lieu of the $68 strike price.
Choice "b" is incorrect. This is the value of the call option at expiration, but the profit or loss should take into account the cost of the option.
Choice "d" is incorrect. This is the cost of the option, but this ignores the option's ending value.

Question 35

Choice "c" is correct. First calculate the net acquisition cost, which is the value of stock – proceeds from call = $40,000 - $5,000 = $35,000. Next, find the ending portfolio value = value of stock – value of call sold = $500 × $72 – 0 = $36,000. Note, the call is not exercised, as the strike price is greater than the ending stock price.

Profit/loss = portfolio value – acquisition cost = $36,000 - $35,000 = $1,000 profit

Choice "a" is incorrect. This is the option exercise price less the stock's closing price times the 500 shares. This is an incorrect and meaningless calculation.
Choice "b" is incorrect. The $1,000 is a profit, not a loss.
Choice "d" is incorrect. The $4,000 is the loss on the stock holding, but this incorrectly ignores the $5,000 option premium.

Question 36

Choice "c" is correct. Paul initially invests the $2.75 cost paid for the call less the $0.49 premium received for the put, or $2.26. At expiration, the intrinsic value of the combination is $3.00, which is the intrinsic value of +3 on the call, less 0 on the short put. Note that the put expires worthless,

because the market price is higher than the exercise price for the put. Thus, his profit is $0.74 ($3.00-$2.26). This is the return on investment of (3 – 2.26)/2.26 = 32.7%.