**46.** You are to price options on a futures contract. The movements of the futures price are modeled by a binomial tree. You are given:

(i) Each period is 6 months.

(ii) $u/d = 4/3$, where $u$ is one plus the rate of gain on the futures price if it goes up, and $d$ is one plus the rate of loss if it goes down.

(iii) The risk-neutral probability of an up move is 1/3.

(iv) The initial futures price is 80.

(v) The continuously compounded risk-free interest rate is 5%.

Let $C_I$ be the price of a 1-year 85-strike European call option on the futures contract, and $C_{II}$ be the price of an otherwise identical American call option.

Determine $C_{II} - C_I$.

(A) 0

(B) 0.022

(C) 0.044

(D) 0.066

(E) 0.088

**47.** Several months ago, an investor sold 100 units of a one-year European call option on a nondividend-paying stock. She immediately delta-hedged the commitment with shares of the stock, but has not ever re-balanced her portfolio. She now decides to close out all positions.

You are given the following information:

(i) The risk-free interest rate is constant.

(ii)

| | Several months ago | Now |
|---|---|---|
| Stock price | \$40.00 | \$50.00 |
| Call option price | \$ 8.88 | \$14.42 |
| Put option price | \$ 1.63 | \$ 0.26 |
| Call option delta | 0.794 | |

The put option in the table above is a European option on the same stock and with the same strike price and expiration date as the call option.