Question 1 :(13 Points)

a. Find the dual of the following linear programming problem (*Don't solve*) (5 points)

Minimize $z = 2x_1 - 3x_2 - 5x_3$

Subject to $x_1 - 2x_2 \geq -1$

$2x_1 + x_2 - x_3 \leq 5$

$x_2 + x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

Solution: Change constraints to: $x_1 - 2x_2 \geq -1$

$-2x_1 - x_2 + x_3 \geq -5$

$-x_2 - x_3 \geq -4$

$x_1, x_2, x_3 \geq 0$ } (2)

The dual: Maximize $W = -y_1 - 5y_2 - 4y_3$ } (1)

Subject to: $y_1 - 2y_2 \leq 2$

$-2y_1 - y_2 - y_3 \leq -3$

$y_2 - y_3 \leq -5$ } (2)

$y_1, y_2, y_3 \geq 0$

b. At what nominal rate of interest compounded semiannually, will money tripled in 10 years. (3 points)

Solution: Let r be the Semiannual rate

$n = (10)(2) = 20$

$S = P(1+r)^n$

$3P = P(1+r)^{20} \Rightarrow (1+r)^{20} = 3$ } (1)

$1 + r = \sqrt[20]{3}$

$r = \sqrt[20]{3} - 1 = 0.0565$ } (1)

$\therefore$ The nominal rate $= 2r$

$= 2(.0565)$

$= 0.113$ } (1)

or $r = 11.3\%$