a) $E[y_i] = E[\beta_1 + \beta_2 x_i + \varepsilon_i] = E[\beta_1 + \beta_2 x_i] + E[\varepsilon_i]$

$= \beta_1 + \beta_2 x_i$

b) $E[y_i] = 1 \times P_r[y_i = 1] + 0 \times P_r[y_i = 0] = P_r[y_i = 1]$

c) $P_r[y_i = 0] = 1 - P_r[y_i = 1] = 1 - \beta_1 - \beta_2 x_i$

d) $\varepsilon_i = \begin{cases} 1 - \beta_1 - \beta_2 x_i & \beta_1 + \beta_2 x_i \\ -\beta_1 - \beta_2 x_i & 1 - \beta_1 - \beta_2 x_i \end{cases}$

e) $V[\varepsilon_i] = E[(\varepsilon_i - 0)] = E[\varepsilon_i^2]$

$V[\varepsilon_i] = (1 - \beta_1 - \beta_2 x_i)^2 \times P_r[y_i = 1] +$

$(-\beta_1 - \beta_2 x_i)^2 \times P_r[y_i = 0] =$

$(1 - \beta_1 - \beta_2 x_i)^2 (\beta_1 + \beta_2 x_i) +$

$(\beta_1 + \beta_2 x_i)^2 (1 - \beta_1 - \beta_2 x_i) =$

$(1 - \beta_1 - \beta_2 x_i)(\beta_1 + \beta_2 x_i)(1 - \beta_1 - \beta_2 x_i + \beta_1 + \beta_2 x_i) =$

$(1 - \beta_1 - \beta_2 x_i)(\beta_1 + \beta_2 x_i)$