Problem 6

Tuesday, June 11, 2024 5:17 PM

a) $$p(x) = \frac{e^{(B_0 + B_1 x_1 + B_2 x_2)}}{1 + e^{(B_0 + B_1 x_1 + B_2 x_2)}}$$

X_1 = hours studied = 40

X_2 = undergrad GPA = 3.5

$b_0 = -6$

$b_1 = .05$

$b_2 = 1$

$$= \frac{e^{-6 + .05(40) + 1(3.5)}}{1 + e^{-6 + .05(40) + 1(3.5)}}$$

$$= \frac{e^{-.5}}{1 + e^{-.5}}$$

$= .3775$ so 37.75% chance of A

b) $$.50 = \frac{e^{(-6 + .05(B_1) + 3.5)}}{1 + e^{(-6 + .05(B_1) + 3.5)}}$$

$$.50 = \frac{e^{(-2.5 + .05B_1)}}{1 - e^{(-2.5 + .05B_1)}}$$

$$\log(.50) = -2.5 + .05B_1 - \log(1 - e^{(-2.5 + .05B_1)})$$

$$-\log(.50) - 2.5 + .05B_1 = \log(1 - e^{(-2.5 + .05B_1)})$$

$$.05B_1 - 2.5 = \log(.5) - \log(1 + e^{(-2.5 + .05B_1)})$$

$$\exp(.05B_1 - 2.5) = \exp(\log(0.5)) \cdot \exp(\log(1 + e^{(-2.5 + .05B_1)}))$$

$$\exp(.05B_1 - 2.5) = 0.5 \cdot (1 + \exp(0.05x - 2.5))$$

$$= .5 + .5\exp(.05x - 2.5))$$

$$\exp(.05B_1 - 2.5) - .5\exp(.05x - 2.5)) = .5$$

$$.5\exp(.05B_1 - 2.5) = .5$$

$$\exp(.05B_1 - 2.5) = 1$$

$$.05B_1 - 2.5 = \log(1)$$

$$.05B_1 = 2.5$$

$$B_1 = \frac{2.5}{.05}$$

$B_1 = 50$

50 hours