PAGE NO.:

ISLR

3.7.3

(a) g = gpa l = level (1/0)
i = IQ gi, gl

$$y = 50 + 20g + 0.07i + 35l + 0.01gi - 10gl$$

College grads ($l = 1$)

$$y_c = 85 + 20g + 0.07i + 0.01gi - 10g$$
$$= 85 + g(10 + 0.08i)$$

High school grads ($l = 0$)

$$y_h = 50 + g(20 + 0.08i)$$

Assume: $y_c > y_h$

$$85 + 10g + 0.08gi > 50 + 20g + 0.08gi$$
$$35 > 10g$$
$$g < 3.5$$

$\therefore$ if $g > 3.5$, $y_h > y_c$

(iii) For a fixed value of IQ & GPA, high school ~~college~~ graduates earn more, on average than ~~high school~~ college graduates, provided that the GPA is high enough

PAGE NO.:

(b) $i = 110 \quad l = 1$
$g = 4$

$$y_c = 85 + 4\,(10 + 0.08\,(110))$$
$$= 85 + 4\,(18.8)$$
$$= 85 + 75.2$$
$$= 160.2$$

(c) False. The value of the coefficient for an interaction term doesn't provide any evidence for or against the chance of an interaction effect. To prove this possibility we have to formulate a hypothesis and compute p-value for the coefficient of the interaction term.

Answer → Given:- $\hat{y}_i = x_i \hat{\beta}$

$= x_i \dfrac{\sum_{i=1}^{n} x_i y_i}{\sum_{i'=1}^{n} x_{i'}^2}$

ISLR 3.7.5

$\hat{y}_i = x_i \dfrac{(x_1 y_1 + x_2 y_2 + \dots + x_n y_n)}{(x_1^2 + x_2^2 + \dots + x_n^2)}$

$= \dfrac{(x_i x_1 y_1 + x_i x_2 y_2 + \dots + x_i x_n y_n)}{(x_1^2 + x_2^2 + \dots + x_n^2)}$

$= \sum_{i'=1}^{n} \left(\dfrac{x_i x_{i'}}{\sum_{j=1}^{n} x_j^2} \right) y_{i'}$

$a_{i'} = \dfrac{x_i x_{i'}}{\sum_{j=1}^{n} x_j^2}$