Denote variables as following

$$Y = \text{complete}, \; T = \text{survival}.$$

(a) Let $X = $ wedge. Consider the Cox proportional hazards regression model

$$h_i(t|x_i) = h_0(t)e^{\beta x_i}$$

Calculate the estimate for the parameter β.

(b) Continue with the model

$$h_i(t|x_i) = h_0(t)e^{\beta x_i},$$

where $X = $ wedge. Estimate the value of the survival function $S(t|x_i) = P(T \geq t|x_i)$ at the time point $t = 1.00$ when $x_i = 0.6$. Also present graphically how the estimate of the survival function $S(t|x_i)$ is behaving when $x_i = 0.6$.

(c) Furthermore, continue with the model

$$h_i(t|x_i) = h_0(t)e^{\beta x_i},$$

where $X = $ wedge. Estimate the hazard ratio

$$\frac{h_i(t|x_i = 0.6)}{h_i(t|x_{i*} = 1.6)}.$$

(d) Consider the following Cox proportional hazards regression model

$$h_i(t|\mathbf{x}_i) = h_0(t) \cdot \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i1} x_{i2}),$$

where $X_1 = $ wedge, $X_2 = $ peelForce and $X_3 = $ interBelt. Test at 5% significance level, is the explanatory variable $X_1 = $ wedge statistically significant variable.

(e) Continue using the model

$$h_i(t|\mathbf{x}_i) = h_0(t) \cdot \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i1} x_{i2}),$$

where $X_1 = $ wedge, $X_2 = $ peelForce and $X_3 = $ interBelt. Create 95% confidence interval for the survival function $S(t|\mathbf{x}_i) = P(T \geq t|\mathbf{x}_i)$ at the time point $t = 1.00$ when $x_{i1} = 0.6$, $x_{i2} = 0.8$, and $x_{i3} = 0.7$.