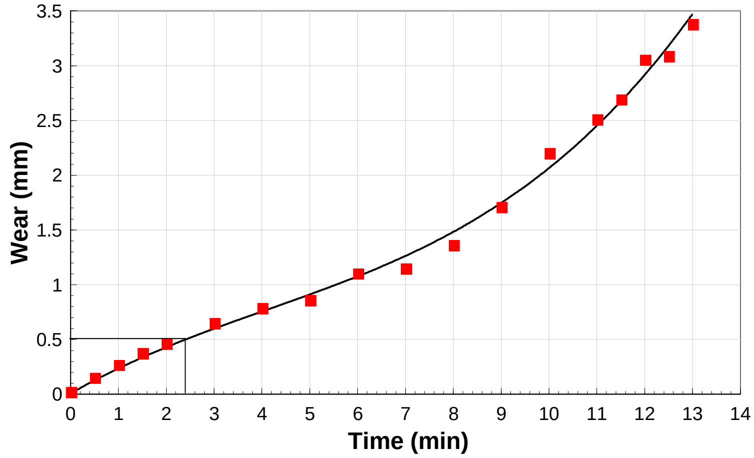
7.1 Consider the flank wear versus time data in the table.

a) A plot of the data is shown below.



Using linear regression to fit a third-order polynomial produces the curve and the estimating equation

$$W(t) = 0.251t - 0.024t^2 + 0.0019t^3 .$$

In fitting the equation to the data the intercept is forced to be zero, as this makes physical sense; i.e., at the start of the cut when the tool is fresh it necessarily has zero wear.

b) Shown on the plot is a horizontal line at the critical wear land and a vertical line dropped to the time axis to show the respective tool life. The same could be determined by solving the equality

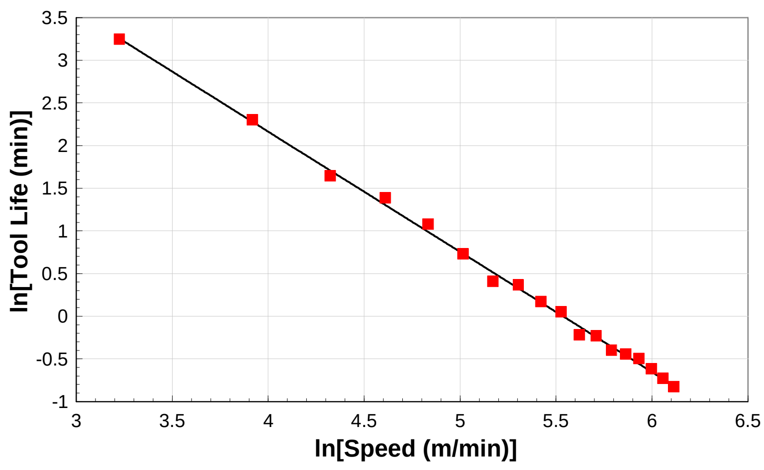
$$0.5 = 0.251t - 0.024t^2 + 0.0019t^3 .$$

Solving the equality seeks the roots of

$$0.0019t^3 - 0.024t^2 + 0.251t - 0.5 = 0 .$$

The final result is t_l = 2.4 min.

7.2 A plot of the data is shown below.



Plotting in the natural-log space allows a line to be fit as shown. The resulting fit is

$$\ln t_l = 7.794 - 1.41 \ln V .$$

Converting to Taylor's constants, the final result (C in m/min) is

$$n = -\frac{1}{-1.41} = \boxed{0.710} \quad \text{and} \quad C = \exp\left(-\frac{7.794}{-1.41}\right) = \boxed{253}.$$