$$f(0) = \lim_{t\to 0} \frac{-t}{1-e^{t\lambda}} = \frac{1}{\lambda}$$

$$f'(t) = -\frac{1-e^{t\lambda}+\lambda e^{t\lambda}t}{(1-e^{t\lambda})^2} \qquad f'(0) = -\frac{\lambda^2-\lambda^2+\lambda^2}{2\lambda^2} = -\frac{1}{2}$$

$$= \lim_{t\to 0} -\frac{\lambda^2 e^{t\lambda} - \lambda^2 e^{t\lambda}(1-\lambda t) - \lambda e^{t\lambda}(-\lambda)}{2(-\lambda e^{t\lambda})(-\lambda e^{t\lambda})}$$

$$f''(t) = -\frac{\lambda^2 e^{t\lambda}t + \lambda^2 e^{2t\lambda}t + 2\lambda e^{t\lambda} - 2\lambda e^{2t\lambda}}{(1-e^{t\lambda})^3}$$

$$f''(0) = -\lim_{t\to 0} f''(t) = \frac{\lambda^4}{(-1)^3 6\lambda^3} = -(-1)^3\frac{\lambda}{6}$$

$$\Rightarrow f(t) = \frac{1}{\lambda} - \frac{1}{2}t + \frac{\lambda}{12}t^2$$

$$\Rightarrow \prod \frac{\lambda_i}{1-e^{t\lambda_i}} = (-1)^2 t^{-2} \lambda_1\lambda_2 \left(\frac{1}{\lambda_1} - \frac{1}{2}t + \frac{\lambda_1}{12}t^2 + \cdots\right)\left(\frac{1}{\lambda_2} - \frac{1}{2}t + \frac{\lambda_2}{12}t^2 + \cdots\right)$$

$$= (-1)^2 t^{-2} \lambda_1\lambda_2 \left(+\frac{1}{\lambda_1\lambda_2} - \frac{1}{2}t\left(\frac{1}{\lambda_1}+\frac{1}{\lambda_2}\right) + \frac{1}{4}t^2 + \left(\frac{\lambda_1}{12}\frac{1}{\lambda_2} + \frac{\lambda_2}{12\lambda_1}\right)t^2 + \cdots\right.$$

$$= (-1)^2 t^{-2}\left(1 - \frac{\lambda_1+\lambda_2}{2}t + \left(\frac{\lambda_1^2+\lambda_2^2}{12} + \frac{\lambda_1\lambda_2}{4}\right)t^2 + \cdots\right.$$

$$\Sigma\lambda_i^2 = (\Sigma\lambda_i)^2 - 2\Sigma\lambda_i\lambda_j$$

$$\frac{\Sigma\lambda_i^2}{12} + \frac{3\Sigma\lambda_i\lambda_j}{12} = \frac{(\Sigma\lambda_i)^2 + \Sigma\lambda_i\lambda_j}{12} = \frac{p'^2 + p^2}{12}$$

Leave this. as it is. Stop here!

In general the coefficient of t^i in the bracketed power series may be expressed as a polynomial in the