1) a)

$$L = \int_{1}^{6} \sqrt{1 + (\tfrac{1}{x} - \tfrac{1}{4}x)^2} \, dx = \int_{1}^{6} \sqrt{\tfrac{1}{2} + \tfrac{1}{x^2} + \tfrac{1}{16}x^2} \, dx$$

$$= \int_{1}^{6} \sqrt{(\tfrac{1}{x} + \tfrac{1}{4}x)^2} \, dx = \int_{1}^{6} \left(\tfrac{1}{x} + \tfrac{1}{4}x\right) dx$$

$$= \ln(x) + \tfrac{x^2}{8} \bigg|_{1}^{6} = \ln(6) + \tfrac{6^2}{8} - \ln(1) - \tfrac{1}{8}$$

$$= \boxed{\ln(6) + \tfrac{35}{8}}$$