3. Dr. Charles Keeling began measuring carbon dioxide in the atmosphere on a continuous basis in 1958. At that time, Dr. Keeling found that the mean concentration level was approximately 315 ppmv. Currently, the level is approximately 385 ppmv. ²

(a) (4 points) Assuming that the mean concentration has been growing linearly from 1958 to 2007, find a formula for \( L(t) \), the mean concentration level of \( \text{CO}_2 \), with \( t \) in years since 1958.

(b) (5 points) If instead, the mean concentration has been growing at an exponential rate, find an exponential function, \( E(t) \), to model the mean concentration level of \( \text{CO}_2 \) in the environment \( t \) years after 1958.

(c) Future \( \text{CO}_2 \) levels are expected to rise due to burning of fossil fuels and land-use changes. The rate of this increase will depend on uncertain economic, sociological, technological, and natural developments. The IPCC Special Report on Emissions Scenarios gives a wide range of \( \text{CO}_2 \) scenarios by the year 2100. Use your functions from parts (a) and (b) to predict the concentration of \( \text{CO}_2 \) in 2100.

(i) (2 points) Prediction if growth is linear:

(ii) (2 points) Prediction if growth is exponential: