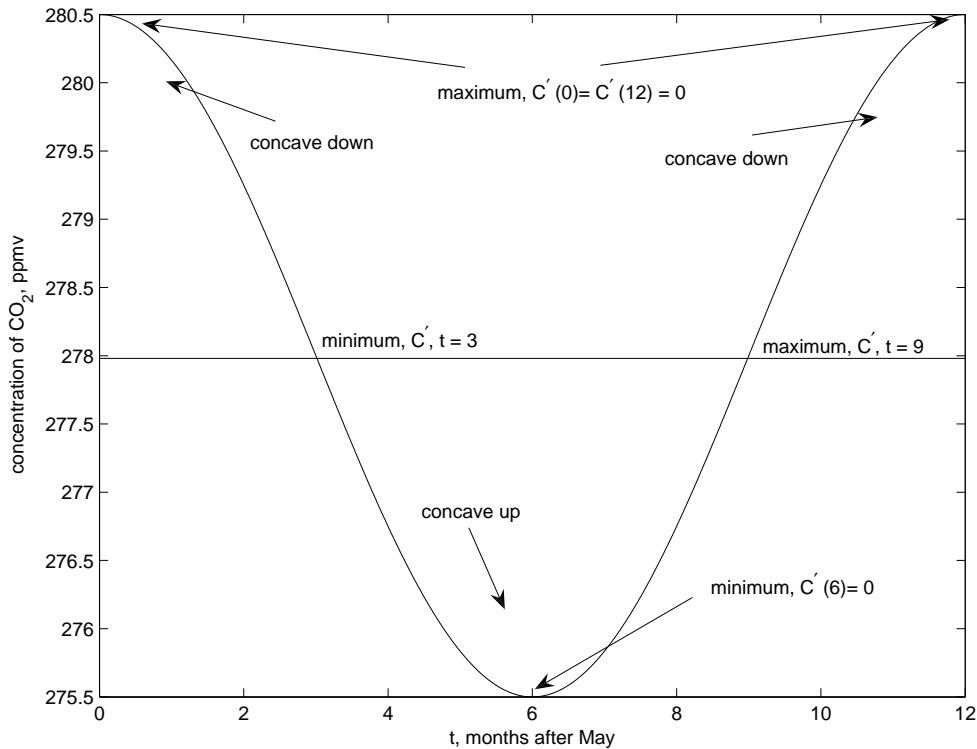


2. Carbon dioxide concentrations in the atmosphere fluctuate seasonally due to the amount of CO_2 taken up by plants. Scientists believe that for thousands of years prior to the industrial era (circa 1800) the cycle fluctuated each year around an average concentration of about 278 ppmv (that is, 278 molecules of CO_2 for every one million molecules of air).¹

- (a) (4 points) Assuming 278 ppmv as the average and a total fluctuation of 5 ppmv between the high and low concentrations, draw a graph of $C(t)$, with t in months, which models the level of CO_2 concentration during the years preceding the industrial era. Let $t = 0$ represent the beginning of the month of May when the concentration is at the highest. Carefully label important features on your graph.



- (b) (5 points) Determine a trigonometric formula for $C(t)$.

$$C(t) = 278 + \frac{5}{2} \cos\left(\frac{\pi}{6} t\right)$$

- (c) (2 points) What is the amplitude of the function C ? $\frac{5}{2}$

- (d) (3 points) At the beginning of which month during the year is the concentration level decreasing fastest? August

¹See http://en.wikipedia.org/wiki/Global_warming