

9. [12 points]

- a. [6 points] While searching for cryptids, Roy claims he found a secret island with crazy thermodynamic properties. According to him, the temperature on the island fluctuates in a 24 hour cycle that can be modeled by a sinusoidal function. The maximum temperature of 45° Celsius occurs at 1 p.m. every day, and the minimum temperature of -25° Celsius occurs at 1 a.m. every day. Let the sinusoidal function $C(t)$ be the temperature, in degrees Celsius, on the island t hours after 8 a.m. Find a formula for $C(t)$.

- b. [6 points] On the island, Roy also claims to have found a population of the elusive Megaconda! In his notes, he writes that it is clear that the population size of Megaconda population must fluctuate in a sinusoidal manner, and that there are $M(t)$ thousand Megacondas t months after his discovery. Let

$$M(t) = 13 \sin\left(\frac{\pi t}{3}\right) + 25$$

Find the first two times after Roy's discovery when the Megaconda population is 18,000. Give your answers using **exact** form.