

5. [7 points] Ross is playing “Dinomite 2” again. In round 2018 he is given that the population of the Gigantosaurus  $t$  years after 65 million years ago can be modeled by the following function:

$$G(t) = 47 + 38 \cos(\pi(t - 3))$$

Help Ross find all values of  $t$  on the interval  $[3, 6.5]$  for which the population of the Gigantosaurus is equal to 77. You should show **all your work** for this problem and give your answer in **exact** form.

*Solution:*

$$\begin{aligned} 77 &= 47 + 38 \cos(\pi(t - 3)) \\ \frac{30}{38} &= \cos(\pi(t - 3)) \\ \pi(t - 3) &= \arccos\left(\frac{30}{38}\right) \\ t &= \frac{1}{\pi} \arccos\left(\frac{30}{38}\right) + 3 \end{aligned}$$

By using the symmetry of the graph we get that the solutions that lie on the interval  $[3, 6.5]$  are:

$$t = \frac{1}{\pi} \arccos\left(\frac{30}{38}\right) + 3, \quad \frac{1}{\pi} \arccos\left(\frac{30}{38}\right) + 5, \quad 5 - \frac{1}{\pi} \arccos\left(\frac{30}{38}\right)$$

6. [5 points] Joey is taking a road trip from New York to Los Angeles to continue his acting career. The computer in his car calculates that when the car’s speed is  $v$  miles per hour (mph), the car uses

$$g = f(v) = \frac{1}{20} \log(27 \cdot 10^v)$$

gallons of gas per hour. Assume the domain of  $f(v)$  is  $(0, 150]$ . Find a formula for  $f^{-1}(g)$ .

*Solution:*

$$\begin{aligned} g &= \frac{1}{20} \log(27 \cdot 10^v) \\ 20g &= \log(27 \cdot 10^v) \\ 20g &= \log(27) + \log(10^v) \\ 20g - \log(27) &= \log(10) \cdot v \\ v &= 20g - \log(27) \end{aligned}$$

$$f^{-1}(g) = \underline{\hspace{10em}} 20g - \log(27) \underline{\hspace{10em}}$$