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:

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

$f^{-1}(g) =$ $20g - \log(27)$

