1. (12 points) Find the functions $f(x)$ and $g(x)$ that fit the following data:

   a. 
   \[
   \begin{array}{c|cccc}
   x & 1 & 2 & 3 & 4 \\
   \hline
   f(x) & 4.9 & 8.1 & 11.3 & 14.5 \\
   \end{array}
   \]

   b. 
   \[
   \begin{array}{c|cccc}
   x & 2 & 4 & 6 & 8 \\
   \hline
   g(x) & 9.3 & 5.95 & 3.81 & 2.48 \\
   \end{array}
   \]

2. (12 points)
   a. Find the growth rate and the doubling time of a population given by
   \[ P(t) = 2000(1.4)^t. \]

   b. Find the decay rate and the half-life of a radioactive substance whose amount at time $t$ is given by
   \[ Q(t) = 300(0.7)^t. \]
3. (13 points) How much money would you have after 20 years if you initially invest $400 in a bank that has an annual interest rate of 6 percent and interest is compounded five times a year? If, instead, interest is compounded continuously, how much money would you have?

4. (12 points)
   a. Below is the graph of a function $f(x)$. In the same xy-plane, graph the inverse function $f^{-1}(x)$.

   b. Given $g(x) = 4x + 9$, find the inverse function $g^{-1}(x)$. 
5. (12 points) a. Given the function \( f(x) = x^3 + x - 3 \), find \( f^{-1}(20) \).

b. Find an equation of the line that passes through the points (1,4), (5,-3).

6. (18 points) Find a possible formula for each of the following functions \( f(x) \), \( g(x) \), and \( h(x) \):
7. (21 points) a. If a bank has an annual interest rate of 5 percent and interest is compounded monthly, what is the effective interest rate?

b. Let \( f(t) \) represent the distance Mary is from home at time \( t \). Assume at time \( t=0 \) she leaves home for school. Mary stops at a friend’s house which is on the way to school and is half way to school. Mary talks to her friend for a good amount of time. She then notices that she forgot her books so she returns home to get her books and immediately walks to school. Draw a possible graph of \( f(t) \) up to the time she arrives at school.

c. Find the values of \( \ln(1) \), \( \log(100) \), and \( \ln(\sqrt{e}) \).

d. Find the length of the arc of a circle of radius 5 if the central angle determined by the arc is 3 radians.