Problem 1 Fill in your solution in the given plotting, don’t start a new one.

a) (3 points) Complete the graph of \( f(x) \), where \( f(x) \) is an even function and part of its graph is given below.

b) (3 points) Complete the graph of \( g(x) \), where \( g(x) \) is an odd function and part of its graph is given below.

c) (4 points) Sketch the graph of \( h^{-1}(x) \) where the graph of \( h(x) \) is given below.
Problem 2 There are two different types of radioactive substance in the lab, type A and B. The half life of type A is 20 seconds, and there are 10 grams of them at the beginning $t = 0$. The half life of type B is 2 seconds, and there are 160 grams of them at the beginning $t = 0$.

a) (4 pts) Write down the formulas $f(t)$ to be the amount of type A there are in the lab at time $t$, and $g(t)$ to be the amount of type B there are in the lab at time $t$.

b) (4 pts) At what time $t$, there are exactly the same amounts of type A and B?

c) (2 pts) Which type of matter will become undetectable first? Explain.
**Problem 3** (10 points) Solve the equations.

a) (4 points) \(-\log_2(x) + \log_2(x^3) = 4\).

b) (4 points) \(\log_2(-x) - \log_2(-x^3) = 4\).

d) (2 points) \(2^{3x-5} = 5^{4x-1}\)
Problem 4 (10 points) Find the intersection points of the line that passes through \((1, 3)\) with slope \(-2\) and the circle that is centered at \((2, 1)\) with radius 10. Then find the distance between the two intersection points.
**Problem 5** (10 points) A small radio transmitter broadcasts in a 44 mile radius. If you drive along a straight line from a city 56 miles south of the transmitter to a second city 53 miles west of the transmitter, during how much of the drive will you pick up a signal from the transmitter?
**Problem 6** (10 points) A bank has annual interest rate 3%, that is if you save a dollar at the beginning of a year, and cash out at the end, you earn 0.03 dollars as interest and combined with the 1 dollar you had, you will have in total 1.03. If you save a dollar at the beginning of a month and cash out at the end, you earn $\frac{0.03}{12}$ dollars as interest, etc.

a) (8 points) Assume the bank allows you to deposit and cash out as frequently as possible. If you have 3 million dollars now, how much interest you can earn at most from the bank in a year? Write your solution as a precise number in terms of $e$. (Hint: You are asked to compute the interest, not the total money you will have.)

b) (2 points) If the bank only allows you do the business annually (that is, you have to save the money for at least a year to earn the interest), use the “Rule of 72” to estimate without a calculator how long it takes for your money to double.