Homework for May 11, 2025.

Algebra. Complex numbers.

Please, complete the previous homework assignments from this year. Review the classwork handout on complex numbers. Complete the classwork exercises and solve the following problems (skip the ones already solved).

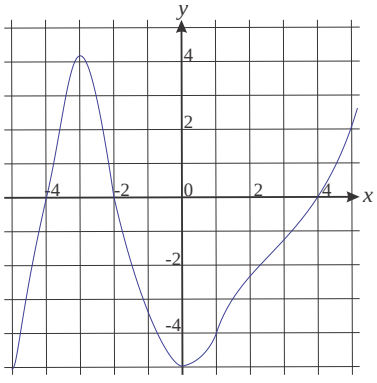
Problems.

1. Compute:
   a. $(2-i)^{-1}$
   b. $\frac{-i}{4\sqrt{3}-i}$
   c. $\frac{1}{3-4i}$
   d. $(1+i)^{-10}$
2. Solve the following equations in complex numbers:
   a. $z^2 = -i$
   b. $z^2 = 2\sqrt{3} + 2i$
   c. $z^2 - z - 1 = 0$
   d. $z^2 + z - 1 = 0$

Algebra. Recap functions and graphs.

Review the classwork handout. Try solving the following problems. Remember: you do not necessarily need to solve all problems, just solve as many as you can within the time you can dedicate to Math 9 homework.

1. From the picture, find in which interval(s) the function $y = f(x)$
   a. is monotonic
   b. has the same sign
2. Find all possible values of a such that equation $x^2 + ax + 9 = 0$ has two different roots, both of which are less than -1.
3. Draw graphs of the following functions
   a. $y = \left|\frac{1}{x-2} + 1\right|$
   b. $y = \frac{1}{|x|-2} + 1$



4. Solve the following equations
   a. (Skanavi 7.141) $3 \cdot 4^x + \frac{1}{3} \cdot 9^{x+2} = 6 \cdot 4^x - \frac{1}{2} \cdot 9^{x+1}$
   b. (Skanavi 7.143) $\sqrt{\log_x \sqrt{x}} = -\log_x 5$
   c. (Skanavi 7.153) $\frac{\log_2(9-2^x)}{3-x} = 1$
   d. (Skanavi 7.160) $\log_a x + \log_{a^2} x + \log_{a^3} x = 11$
   e. (Skanavi 7.184) $2^{x-1} + 2^{x-4} + 2^{x-2} = 6.5 + 3.25 + 1.625 + \cdots$
   f. (Skanavi 7.190) $9^x + 6^x = 2^{2x+1}$
   g. (Skanavi 7.197) $4^{\log x+1} - 6^{\log x} - 2 \cdot 3^{\log x^2+2} = 0$
   h. (Skanavi 7.299) $(x^2 - x - 1)^{x^2-1} = 1$
   i. (Skanavi 7.304) find integer root: $\log_{\sqrt{x}}(x + 12) = 8 \log_{x+12} x$
   j. (Skanavi 7.308) $\log_{x+3}\left(3 - \sqrt{1 - 2x + x^2}\right) = \frac{1}{2}$
5. (Skanavi 7.277) Equation $4^x + 10^x = 25^x$ has a single root. Find this root. Is it positive or negative? Is it larger or less than 1?
6. (Skanavi 7.280) Show that:

$$\log_3 2 \cdot \log_4 3 \cdot \log_5 4 \cdot \log_6 5 \cdot \log_7 6 \cdot \log_8 7 = \frac{1}{3}$$