

Problem 1 (4 points). Explain what a transcendental function is, and give an example.

Solution. A transcendental function is, roughly, a function you cannot create by addition, subtraction, multiplication, division, or root extraction of the variable x . A few examples are exponential functions, logarithmic functions, and trigonometric functions. \square

Problem 2 (6 points). Find the values of x that satisfy

$$4^{-2x+1} = 2^{x^2+x+5}.$$

Solution. Recall that $a^b = a^c$ implies $b = c$. This requires the bases to be the same, so we rewrite 4 as 2^2 , and use the law of exponent $(a^b)^c = a^{bc}$ to rewrite the original equation as

$$2^{2(-2x+1)} = 2^{x^2+x+5}.$$

Then we have $2(-2x + 1) = x^2 + x + 5$, or

$$0 = x^2 + 5x + 3,$$

whence by the quadratic formula

$$x = \frac{-5 \pm \sqrt{13}}{2}.$$

\square