

CUNY City Tech, MAT 1275, Fall 2026

Fun problems from Yao-Rui Yeo (Last updated: October 10, 2026)

These fun problems are not to be turned in for credit.

Problems may be added if I think of something that can amuse one while commuting.

Fun problems may also appear as extra credit in midterms.

Problem 1: Suppose I have a secret list of ten positive whole numbers $a_1, a_2, \dots, a_{10}$. Your job is to figure out these ten numbers using the following procedure.

- Give me two sets of positive whole numbers $b_1, \dots, b_{10}$ and $c_1, \dots, c_{10}$.
- I will return you the values $a_1b_1 + \dots + a_{10}b_{10}$ and $a_1c_1 + \dots + a_{10}c_{10}$. Of course, I will not tell you my secret list.

Can you choose the twenty numbers $b_1, \dots, b_{10}, c_1, \dots, c_{10}$ wisely to recover my secret list using information obtained from one just iteration of the procedure above?

Problem 2: Let $f(x)$ be a polynomial of degree 10, i.e.

$$f(x) = a_{10}x^{10} + a_9x^9 + a_8x^8 + a_7x^7 + a_6x^6 + a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$$

where the a_i 's are either fractions or numbers. Suppose

$$f(i) = \frac{1}{i} \quad \text{for } i = 1, 2, 3, \dots, 11.$$

What is the value of $f(12)$?

Problem 3: For any positive number x , consider the infinite nested radical

$$\sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}}}$$

Is there any value of x such that the infinite nested radical equals 1? How about 10?

Problem 4: Solve for real values of x .

$$9^{\sin^2 x} + 9^{\cos^2 x} = 10.$$

Problem 5: Show that there are no real values of x such that

$$|\sin x + \cos x + \tan x + \csc x + \sec x + \cot x| = 0.$$

As a bonus, find the minimum value of the function in the left side of the equation.