

MATLAB Programming Language

Programming Assignment One

Problem sets

- There are two problem sets. You must finish all of them.
- You must use MATLAB with the required version to implement your programs.
- You can use any valid functions in MATLAB to implement your programs as long as your programs do not violate the specified requirement of the assignment(s).

File naming convention

Write your programs in a file.

The file name is m_yourStudentID_YourName.m.

For example, if your name is Peter and ID is 12345678, then the file name must be m_12345678_Peter.

Note: YourName should be in letters

Output the results that are required only.

Do not output all the results.

You **must not** input the elements explicitly one by one.

Program instruction

For each problem, display the problem number before showing the results.

% This instruction is not included in the instruction count of your program

```
disp('Problem 1.1')      % show "Problem 1.1. "
```

Program instruction

At the top of the file, write down your name, ID, email address, department, and date.

%%%

% Student Name: ...

% Student ID: ...

% Email address: ...

% Department: Computer Science, NYCU

% Date:

%%%%%%%%%

Example

Given n, create the following matrix:

z =

1 2 3 4 5 6 ... n % contains n elements

Use at most two instructions. You can change n to get a new row vector.

=====

If you type

n = 10; % instruction 1. You must write this instruction.

z = [1 2 3 4 5 6 7 8 9 10] % instruction 2

Your score is zero.

=====

You may type:

n = 10; % **do not output n**

z = [1:n] or z = [1:1:n]

Instruction

- An instruction is a standalone entity which can be executed by MATLAB.
- You can only use commas and semicolons to define a matrix.
- An instruction must not contain a comma or semicolon except at the end of an instruction.

e.g.,

`a = 10`

`%This line is one instruction`

`a = 10;`

`%This line is one instruction`

`a = 6, b = 10`

`%This line has two instructions`

`a = 6, b = 10;`

`%This line has two instructions`

`a = 6; b = 10; c = a.*b + 1;`

`%This line has three instructions`

`[x y] = meshgrid((1:n)');`

`%This line has one instruction`

Problem Set 1

Problem 1.1

Create a row vector P whose elements are from $-2n$ to $2n$, with an increment of 2.

For example

$n = 4;$ **% Our TAs will change n to another value to check your answer**

$P =$

-8 -6 -4 -2 0 2 4 6 8

Use at most two instructions, , including the line that specifies n .

You can change n to get a new row vector P .

Problem 1.2

You must use meshgrid to create the following matrix.

$$Q = 1^2 + 2^2 + 3^2 + \dots + n^2$$
$$1 \quad 2^2 \quad 3^2 \quad \dots \quad n^2$$

...

$$1 \quad 2^2 \quad 3^2 \quad \dots \quad n^2$$

Q has n identical rows

Use at most 2 instructions, including the line that specifies n.

n = number, e.g., n = 10 (this is one instruction)

Example:

When $n = 10$,

your program outputs

 $Q =$

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

1 4 9 16 25 36 49 64 81 100

Problem 1.3

Given n , create the following row vector consisting of n elements:

$R = [1 \ -2 \ 3 \ -4 \ 5 \ -6 \ 7 \ -8 \ 9 \ -10 \ 11 \ \dots]$

Use at most 4 instructions , including the line that specifies n .

You can change n to get a new row vector.

Example:

When $n = 10$,
your program outputs

$R = [1 \ -2 \ 3 \ -4 \ 5 \ -6 \ 7 \ -8 \ 9 \ -10]$

Problem 1.4

Given n , create the following matrix consisting of n elements:

$S = [1 \ 3 \ 3 \ 5 \ 5 \ 7 \ 7 \ 9 \ 9 \ 11 \ \dots]$

Use at most 4 instructions, including the line that specifies n .

You can change n to get a new row vector.

You must not use mod.

Example:

When $n = 6$,
your program outputs

$S = [1 \ 3 \ 3 \ 5 \ 5 \ 7]$

=====

When $n = 7$,
your program outputs

$S = [1 \ 3 \ 3 \ 5 \ 5 \ 7 \ 7]$

=====

When $n = 14$,
your program outputs

$S = [1 \ 3 \ 3 \ 5 \ 5 \ 7 \ 7 \ 9 \ 9 \ 11 \ 11 \ 13 \ 13 \ 15]$

Problem 1.5

You must use mod to create the following row vector which contains n elements:

$T = [4+1 \ 3+2 \ 2+3 \ 1+4 \ 4+5 \ 3+6 \ 2+7 \ \dots]$

Use at most 2 instructions , including the line that specifies n.

You can change n to get a new row vector.

You need to learn how to use the mod operator on your own.

Example:

When n = 6,
your program outputs

$T = [5 \ 5 \ 5 \ 5 \ 9 \ 9]$

=====

When n = 7,
your program outputs

$T = [5 \ 5 \ 5 \ 5 \ 9 \ 9 \ 9]$

=====

When n = 8,
your program outputs

$T = [5 \ 5 \ 5 \ 5 \ 9 \ 9 \ 9 \ 9]$

=====

When n = 17,
your program outputs

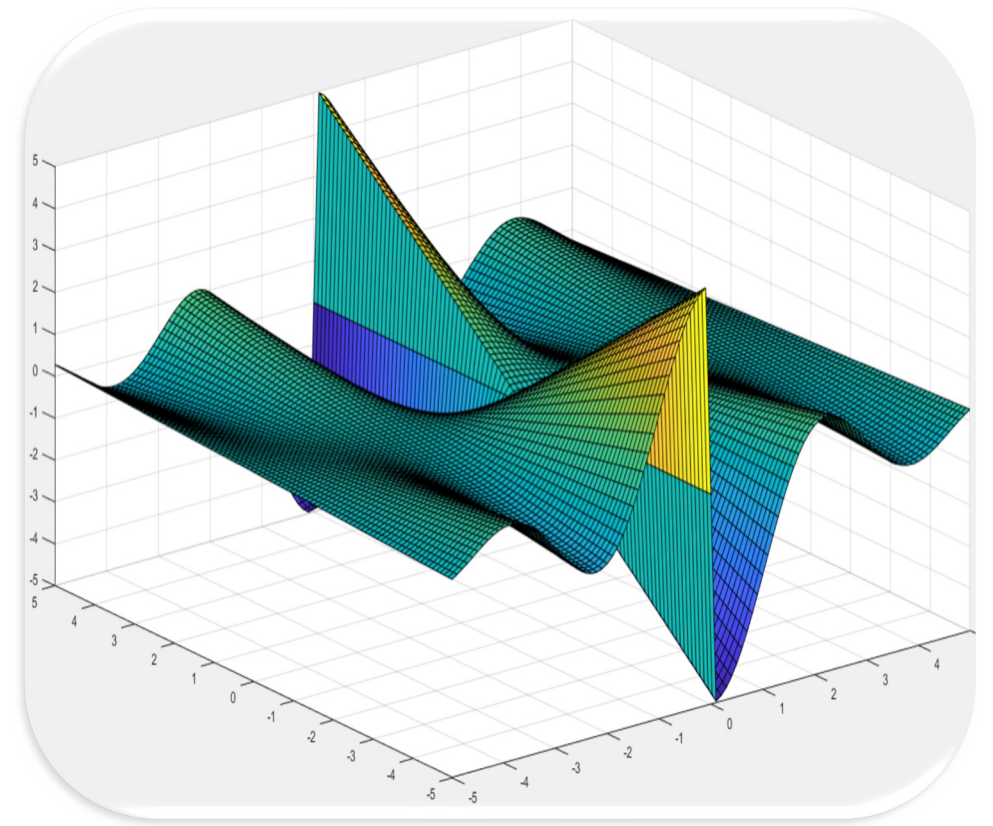
$T = [5 \ 5 \ 5 \ 5 \ 9 \ 9 \ 9 \ 9 \ 13 \ 13 \ 13 \ 13 \ 17 \ 17 \ 17 \ 17 \ 21]$

Problem Set 2

Problem Set 2

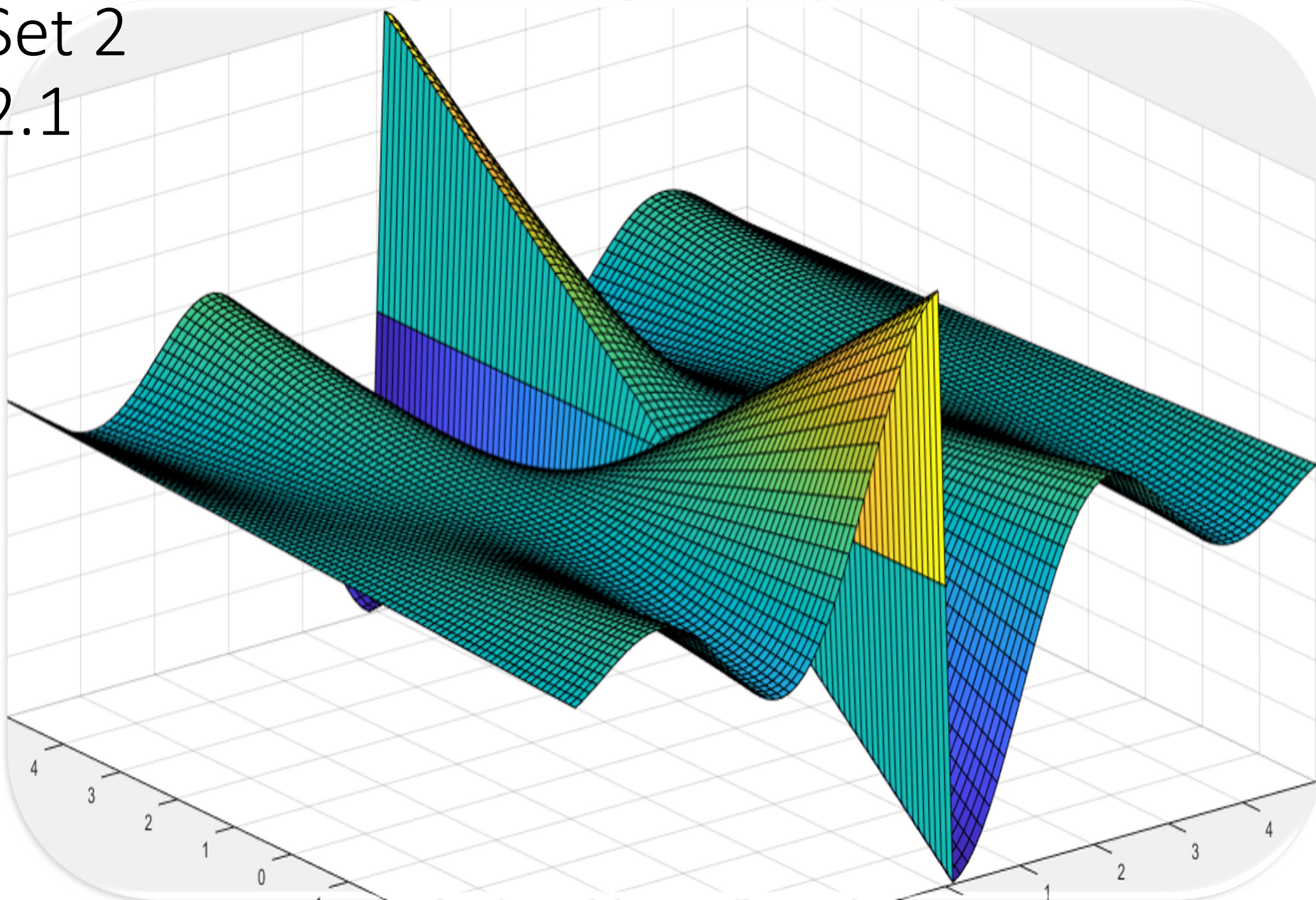
Problem 2.1

- Use surf to plot a graph
- $z = y \sin(x) \cos(x) / (|x| + \text{eps})$
- x in $[-r, r]$
- y in $[-r, r]$
- z in $[-r, r]$
- Use: shading faceted
- You can use a smaller step size to get a smoother surface.
- Type: help shading
- Try different shading methods: flat, interp, faceted



Problem Set 2

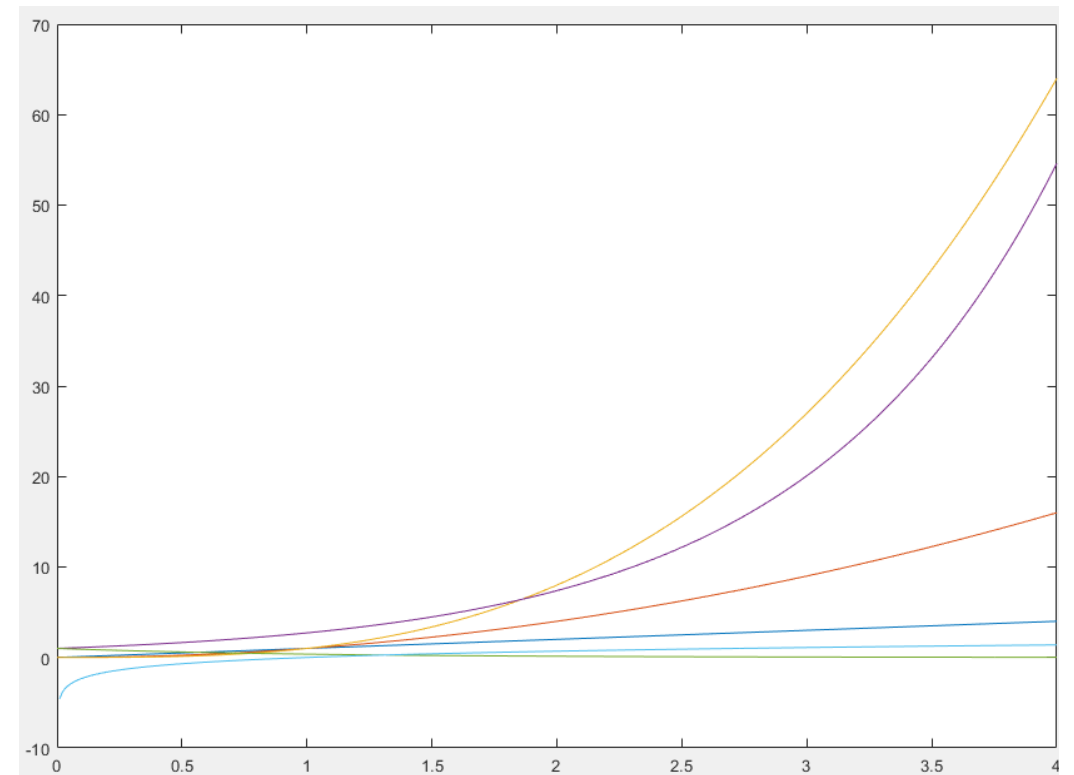
Problem 2.1



Problem Set 2

Problem 2.2

- Plot the following functions in the same figure.
- $y = x$;
- $y = x^2$;
- $y = x^3$;
- $y = e^x$
- $y = e^{-x}$
- $y = \log x$
- x in $[0, 4]$. Step size 0.01.
- You can use **clf** to clear all figures.
- Do you know how to label the curves?
- e is the natural log base.

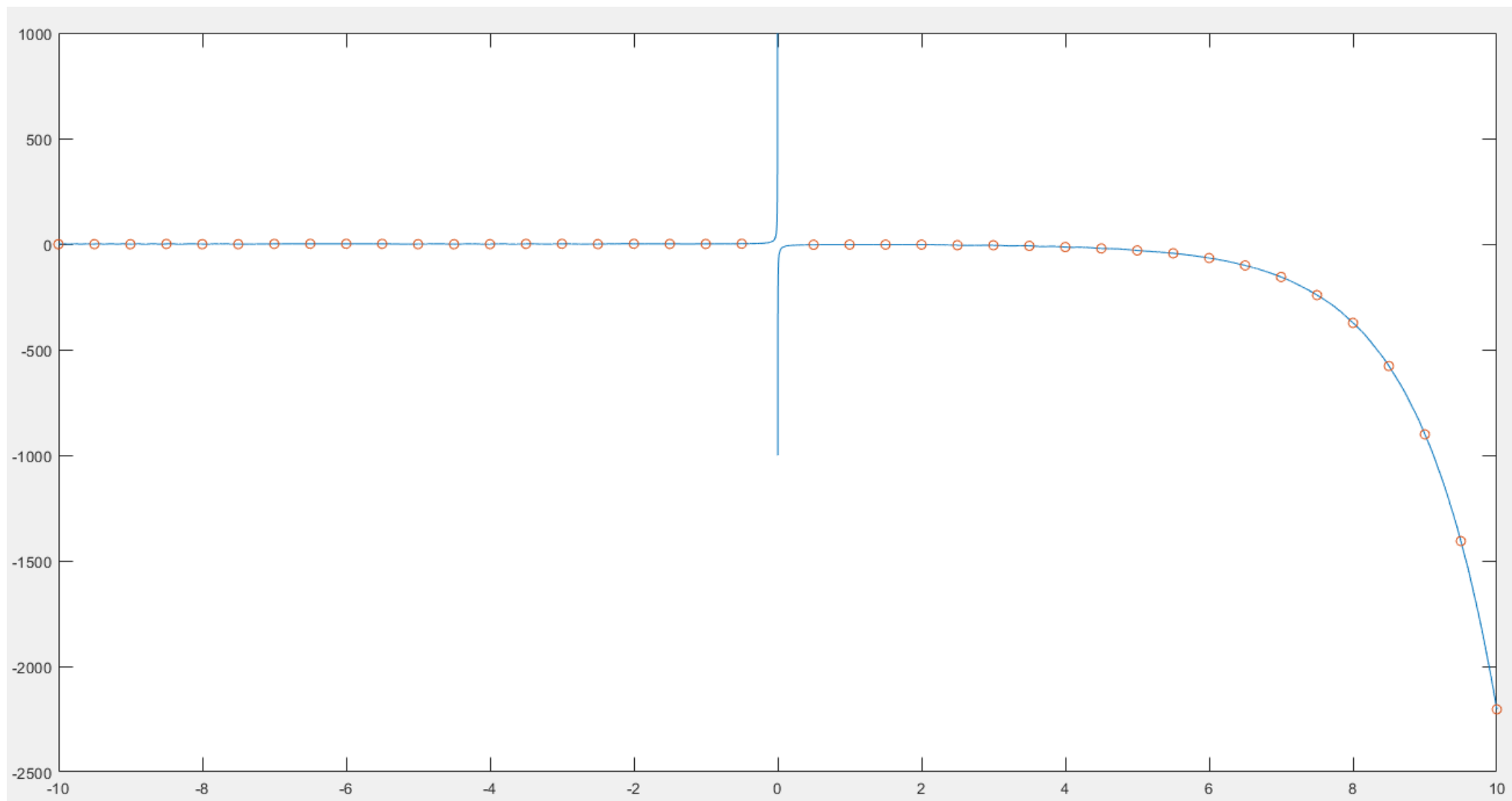


Problem Set 2

Problem 2.3

- Plot the composite function $z(x, y(x))$ with solid line segments and 'o'.
- $y = \sin(x) - x$;
- $z = \sin(y^2) - e^x/x$;
- x is inside $[-10, 10]$.
- e is the natural log base.
- x 's step size is 0.5 when plot in 'o' style. Could we use step size 0.001?
- x 's step size is 0.001 when plot in line segments

$$y = \sin(x) - x;$$
$$z = \sin(y^2) - e^x/x;$$

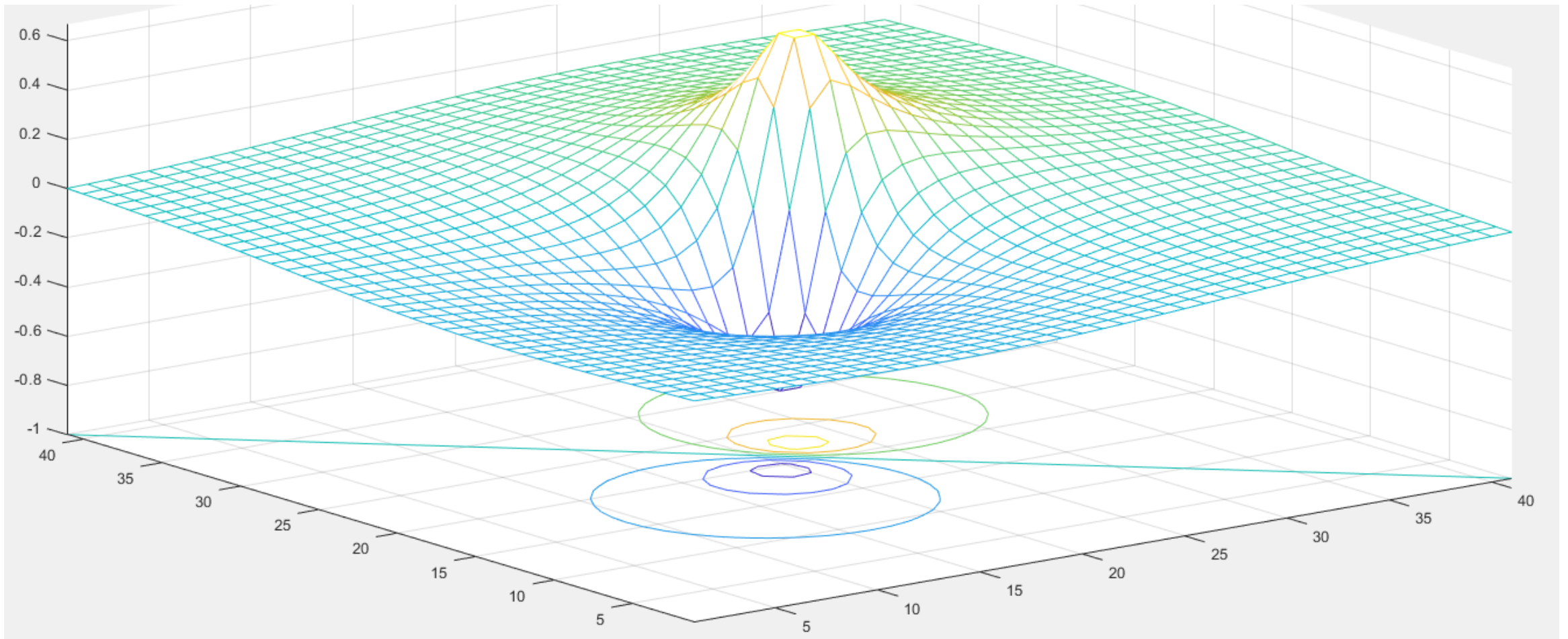


Problem Set 2

Problem 2.4

- Plot the following surface.
- $z = (x + y) / (x^2 + y^2 + 1)$
- x is inside $[-10, 10]$.
- y is inside $[-10, 10]$.
- Step size is 0.5.
- Use meshc, and shading faceted.
- Try to use a step size: 0.01. Check the result again.
- Use clf to clear the figure.

$$z = (x + y) / (x^2 + y^2 + 1)$$



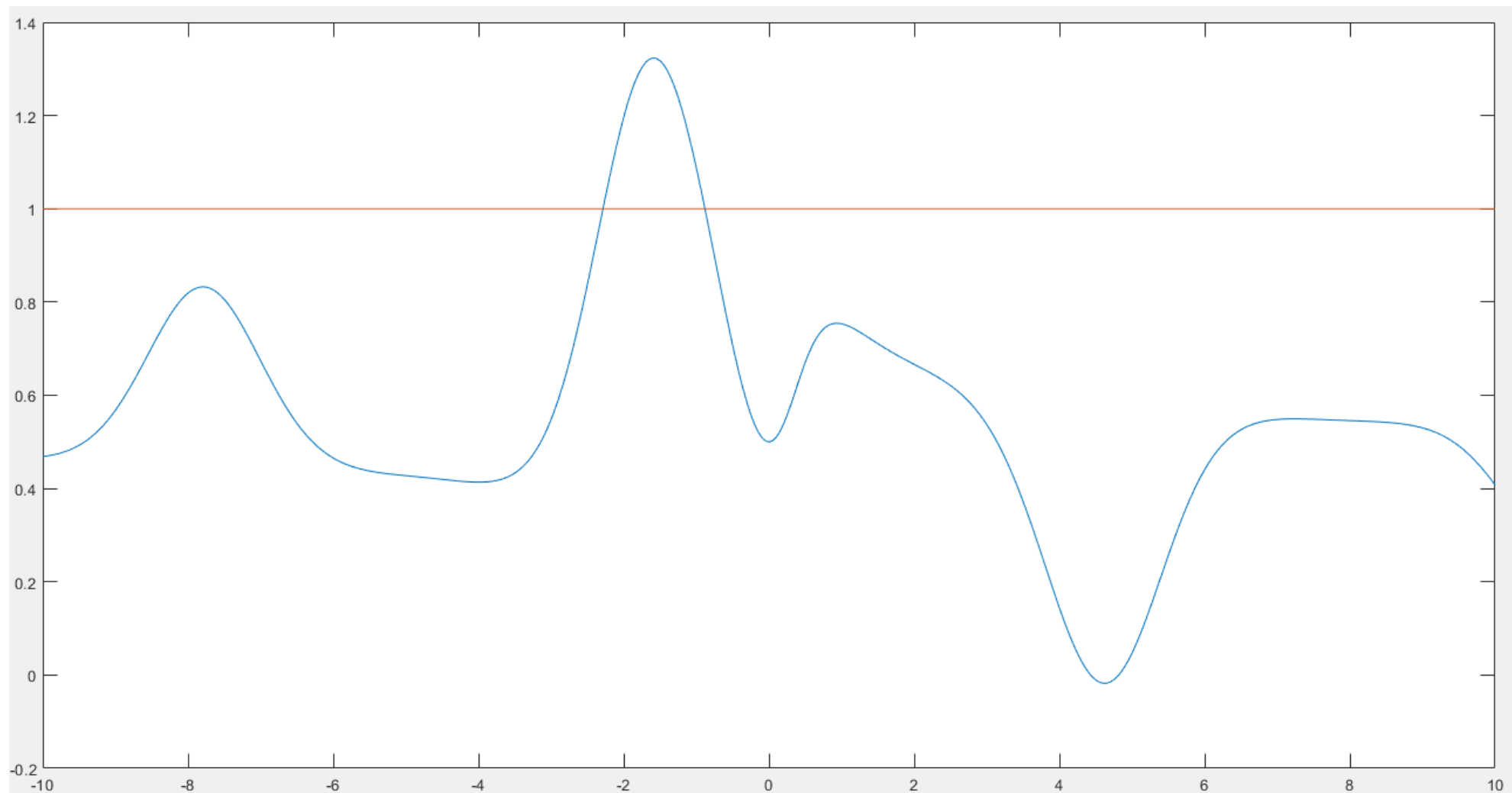
Problem Set 2

Problem 2.5

- Plot the following functions.
- $y = 0.5 + (x \sin x) / (x^2 e^{\sin x} + 1);$
- $y = \cos^2 x + \sin^2 x$
- x is inside $[-10, 10]$.
- The step size for x is 0.05;
- You can use `size(x, 2)` to get the number of columns of x .

$$y = 0.5 + (x \sin x) / (x^2 e^{\sin x} + 1);$$

$$y = \cos^2 x + \sin^2 x$$



End

- Enjoy MATLAB Programming.