Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

New: if the submitted code is not runnable (e.g. because the project is not shared with the instructor, or because not all needed files have been uploaded, or because the code has not been tested in the first place, or for any other reason that has been under complete student's control, the homework grade is decreased by 10%.

Question:	1	2	3	4	Total
Points:	25	20	10	5	60
Score:					

Instructor/grader comments:

Orthogonal polynomials

1. (25 points) Construct the first four polynomials that are orthogonal on $(-\infty, \infty)$ with the weight function

$$w(x) = e^{-\frac{x^2}{2}}.$$

Hint: you may need the following integral.

$$\int_{-\infty}^{\infty} e^{-\frac{x^2}{2}} x^{2k} \mathrm{d}x = \sqrt{2\pi}(2k-1)!!,$$

where

$$(2k-1)!! = (2k-1)\cdot(2k-3)\cdot\ldots\cdot 3\cdot 1,$$

and by convention

$$0!! \equiv 1.$$

2. (20 points) Use linear least squares approximation and singular value decomposition to fit the noisy data returned by the function `hw07p2noisydata()`

```
function [x, y] = hw07p2noisydata()
```

using the expression

$$y(x) = a_1 + a_2 \sin(x) + a_3 e^{-x/2}.$$

Write the function

```
function a = mysvdfit(x, y)
% MYSVDFIT SVD least squares fit of (x,y) data.
% Return the coefficients of the best fit
% p(x) = a(1) + a(2)*sin(x) + a(3)*exp(-x/2)
```

and call it from your main script. Use matlab's own svd function.

On the same graph plot your noisy data and you least squares fit.

The file hw07p2noisydata.m is available for download on the course website.

Gitlab

3. (10 points) Create a gitlab project called **hw07** (name it exactly as shown). Upload **all** required matlab code and create your readme file. Share the project with the instructor.

4. (5 points) Clearly describe your observations and conclusions in your project's readme file.