CS3414. Practice problems. #3

1 Question

What *minimum* degree polynomial will produce a reasonable (same general shape) interpolation for $f(x) = sin(x)$, $-2\pi < x < 2\pi$?

A) 3 B) 4 C) 5 D) 6 E) 7

2 Question

You need to interpolate xe^{-x^2} on [-10, 10]. You have tried a 5-th degree polynomial with equidistant nodes and it does not look good. You may try one of the following EXCEPT:

A) A 6-th degree polynomial with unequally spaced nodes.
B) A 10-th degree polynomial with equally spaced nodes.
C) A 5-th degree polynomial with Chebyshev nodes.
D) A non-polynomial fit.

3 Question

You have a set of experimental data (e.g. market trends as a function of time, very little noise) which you need to analyze. In particular, you are interested to learn something about the 4-th derivative of the data with respect to time. Depending on details of the data and the specific question(s) asked, you may recommend one of the following interpolation schemes to represent your trends, EXCEPT: (`EXPLAIN`).

A) A low degree polynomial interpolation.
B) A high degree polynomial interpolation.
C) A high degree polynomial interpolation with unequally spaced nodes.
D) A natural cubic spline interpolation.

4 Question

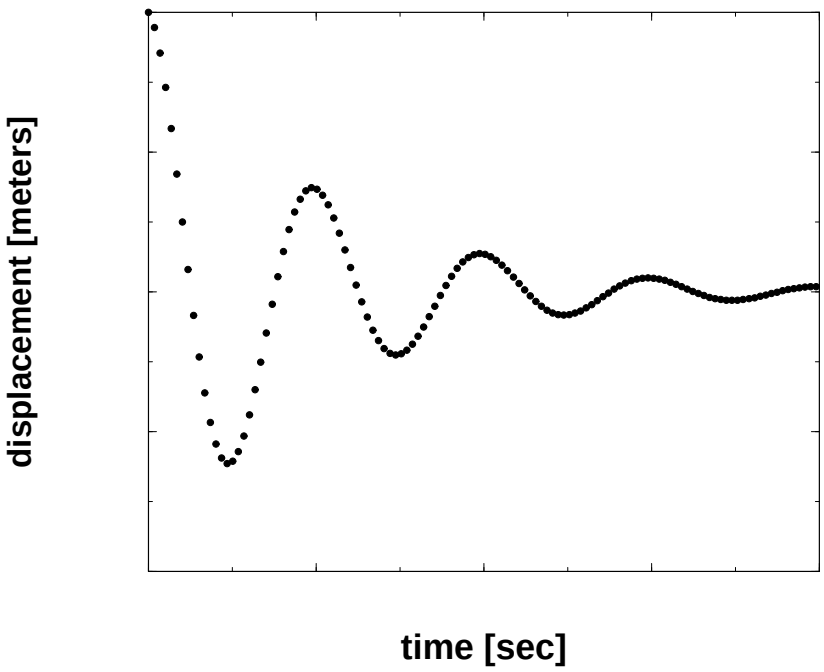

Figure 1: Giant truck suspension system test. Vertical axis – body displacement. Horizontal axis – time.

The above figure (Fig. 1) represents results of an experiment. Your task is to approximate the data using *least square fit* procedure. Which of the following basis function sets is best? `EXPLAIN`. Note: $\{g_j(x)\} \times \{f_k(x)\}$ denotes a set of all possible pair products such as $g_1(x) * f_1(x), g_1(x) * f_2(x)....g_2(x) * f_1(x)....$

A) $\{1, x, x^2, ...\}$

B) $\{sin(\omega t), sin(2\omega t), sin(3\omega t), ...\}$

C) $\{cos(t), cos(2t), cos(3t), ...\} \times \{1, e^{\alpha t}\}$

D) $\{1, e^{\alpha t}, e^{2\alpha t}, e^{3\alpha t}, ...\}$

E) $\{sin(t), sin(2t), sin(3t), ...\} \times \{1, e^{\alpha t}\}$