

- 1) (10 pts) It can be proved mathematically that *absolute error* for Simpson's rule is bounded by

$$|\text{absolute error}| \leq \frac{(b-a)h^4}{180} \max_{[a \leq x \leq b]} |f''''(x)|.$$

Write a short technical report that verifies this error bound for the integral

$$\int_{-2}^3 x e^{-x} dx.$$

An outline of this process is as follows:

- a) Assume the desired *absolute error* is  $10^{-6}$ .
- b) Determine the value of  $n$  necessary to achieve this error. Note that you need the smallest value for  $n$  that works.
- c) Determine the corresponding value for  $h$  once the required  $n$  is known.
- d) Create a table of  $|f''''(x)|$  and use this to estimate the maximum value of  $|f''''(x)|$  over the range of integration.
- e) Compute the right side of the error inequality.
- f) Verify that the quantity you computed in step e) is greater than the absolute error for your integral approximation.

You can write any equations by hand if you like provided that they are neatly written.