

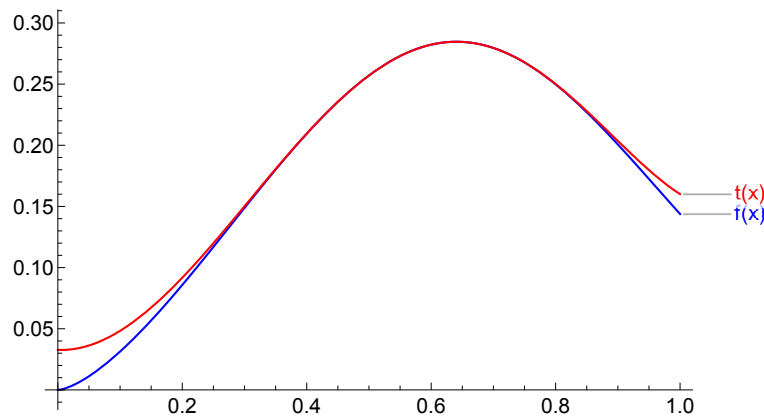
The purpose of this worksheet is to introduce the basic Fortran program structure, to learn how to use the variable types REAL and INTEGER, and how to work with intrinsic functions (SIN(X), COS(X), EXP(X), ABS(X)).

Given are the following two functions,

$$f(x) = e^{-x^2 \sin^2(x)} x^{3/2} \cos^2(x), \quad (1)$$

$$t(x) = 0.282255 + 0.116743(-0.6 + x) - 1.42075(-0.6 + x)^2 - 0.452575(-0.6 + x)^3 + 2.77134(-0.6 + x)^4 + 1.60659(-0.6 + x)^5 \quad (2)$$

where  $t(x)$  is the Taylor expansion of  $f(x)$  for  $x \in [0, 1]$ . They are shown graphically in the figure below.



### Task

Write a structured Fortran program which computes  $f(x)$  and  $t(x)$  for a given value of  $x$ .

### Program Design

1. Include a preamble at the beginning of the program.
2. The user should be prompted to enter the numerical value of  $x$  using the keyboard.
3. The following quantities are to be written to standard output (i.e., to terminal):  $x$ ,  $f(x)$ ,  $t(x)$ , and  $\Delta(x) \equiv |f(x) - t(x)|$ .
4. Test your code for  $x = 0, 0.2, 0.6, 1.0$ . For these cases, the terminal outputs should look like shown below:

```

Input value for x:
0
  0.00000000      0.00000000      3.27325761E-02   3.27325761E-02

Input value for x:
0.2
  0.200000003    8.57769325E-02   9.16974023E-02   5.92046976E-03
    
```

Input value for x:  
0.6  
0.600000024      0.282255024      0.282254994      2.98023224E-08

Input value for x:  
1  
1.00000000      0.143800780      0.160065189      1.62644088E-02

**Submission Instructions:** Email a copy of your source code to [ewhart317@gmail.com](mailto:ewhart317@gmail.com). Put Last First WS 4 in the subject line.