APM525 - High Performance Computing - Assignment 2

Q2.

ε = 0.1, ω0 = 0.16, ω = 0.26
val_f_qp = -7.70139683e-02
val_f_dp = -7.70139683e-02
val_f_sp = -7.70134628e-02

Q3.

ε = 0.1, ω0 = 0.16, ω = 0.26
rel_f_dp = 4.20386494e-15
rel_f_sp = 6.56334392e-06

Q4.

ε = 0.01, ω0 = 0.16, ω = 0.161
val_f_qp = -7.70552425e-02
val_f_dp = -7.70552425e-02
val_f_sp = -7.70587698e-02
rel_f_dp = 1.33987894e-12
rel_f_sp = 4.57751937e-05

Q5.

ε = 0.000001, ω0 = 0.16, ω = 0.160001
val_f_qp = -7.70555602e-02
val_f_dp = -7.70555602e-02
val_f_sp = 0.00000000e+00
rel_f_dp = 1.40168654e-11
rel_f_sp = 1.00000000e+0

Q6.

It is observed that for a given precision the accuracy deteriorates as ε decreases. This is due to the lack of bits to store the exact value of a high precision value when compared to long double at different ϵ in float and double results in increase of relative error as ϵ decreases.

Q7.

a. For $\epsilon = 0.1$
   rel_t_sp = 3.13600060e-05
   val_f_qp = -7.70139683e-02
   val_t_sp = -7.70163834e-02

b. For $\epsilon = 0.000001$
   rel_t_sp = 1.13931819e-06
   val_f_qp = -7.70555602e-02
   val_t_sp = -7.70556480e-02

The relative error decreases as epsilon decreases for taylor series approximation due the same reasoning as above as the lack of bits to store the exact value of a high precision value when compared to long double at different ϵ in float and double results in increase of relative error as ϵ decreases.