Notes on the GSW function
gsw_deltaSA_from_rho_t_exact(rho,SP,t,p)

Notes written 23rd June 2013.

This function has inputs of *in situ* density, "rho", Practical Salinity, "SP", *in situ* temperature, "t", and sea pressure, "p". This function is essentially the following three lines of code

```
SA = gsw_SA_from_rho_t_exact(rho,t,p);
SR = gsw_SR_from_SP(SP);
deltaSA = SA - SR;
```

That is, Absolute Salinity is first calculated from the input values of *in situ* density, *in situ* temperature and sea pressure. Reference Salinity (which is simply proportional to Practical Salinity) is then calculated and subtracted from the value of Absolute Salinity to yield the Absolute Salinity Anomaly, "deltaSA", δS_A.

This function uses the full TEOS-10 Gibbs function $g(S_A, t, p)$ of IOC *et al.* (2010), being the sum of the IAPWS-09 and IAPWS-08 Gibbs functions.

One use for this function is in the laboratory where a measured value of the *in situ* density ρ of a seawater sample may have been made at the laboratory temperature *t* and at atmospheric pressure *p*. Given knowledge of the sample's Practical Salinity, the present function will return the Absolute Salinity Anomaly δS_A of this seawater sample.

References

IAPWS, 2008: Release on the IAPWS Formulation 2008 for the Thermodynamic Properties of Seawater. The International Association for the Properties of Water and Steam. Berlin, Germany, September 2008, available from www.iapws.org. This Release is referred to in the text as **IAPWS-08**.

IAPWS, 2009: Supplementary Release on a Computationally Efficient Thermodynamic Formulation for Liquid Water for Oceanographic Use. The International Association for the Properties of Water and Steam. Doorwerth, The Netherlands, September 2009, available from http://www.iapws.org. This Release is referred to in the text as **IAPWS-09**.

IOC, SCOR and IAPSO, 2010: *The international thermodynamic equation of seawater – 2010: Calculation and use of thermodynamic properties*. Intergovernmental Oceanographic Commission, Manuals and Guides No. 56, UNESCO (English), 196 pp. Available from http://www.TEOS-10.org