**Home Assignment – 1**
*(Dead Line 18/8/2016)*

1. Write a F90/95 program to verify following trigonometric properties:
   a) $\sin^2 x + \cos^2 x = 1$
   b) $\sec^2 x - \tan^2 x = 1$
   c) $\cosec^2 x - \cot^2 x = 1$
   d) $\cos (A - B) = \cos A \cos B + \sin A \sin B$
   e) $\sin (A + B) = \sin A \cos B + \cos A \sin B$
   f) $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$
   g) $\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$
   h) $\sin(3A) = 3\sin(A) - 4\sin^3(A)$
   i) $\cos(3A) = 4\cos^3(A) - 3\cos(A)$

2. Write a F90/95 program to verify following trigonometric properties:
   a) $\sin^{-1}(x) + \cos^{-1}(x) = \pi/2$
   b) $\tan^{-1}(x) + \cot^{-1}(x) = \pi/2$
   c) $\tan^{-1}(x) + \tan^{-1}(1/x) = \pi/2$, if $x > 0$ and $-\pi/2$ if $x < 0$
   d) $\sec^{-1}(x) + \cosec^{-1}(x) = \pi/2$
   e) $\cos^{-1}(-x) = \pi - \cos^{-1}(x)$
   f) $\tan^{-1}(-x) = -\tan^{-1}(x)$

3. Write a F90/95 program to verify the following:
   a) $\sinh(x) = (e^x - e^{-x})/2$
   b) $\cosh(x) = (e^x + e^{-x})/2$
   c) $\tanh(x) = (e^x - e^{-x})/(e^x + e^{-x})$

4. Write a Fortran 90/95 program that accepts as input temperature in degree Fahrenheit, converts it to its equivalent in degree centigrade.

5. Write a Fortran 90/95 program that reads a number and prints out the sum and product of its digits.
6. Write a Fortran 90/95 program to calculate the area and volume of the following geometrical figures: Sphere, Cylinder, Pyramid and Cone.

7. If \( a = 2 \), \( b = 3 \), and \( c = 5 \), then use a Fortran program to calculate,

\[
able + 1/bc + bc/(ab+bc) + (ab+bc+ac)/(a + b + c)/(abc)
\]

8. The exponential function \( e^x \) can be defined as

\[
e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots
\]

if \( x = 5 \), then find the value of \( e^x \) from the series and using Fortran library function. What is the difference?

9. Write a Fortran 90/95 program to check the following formula,

\[
\sqrt[n]{ab} = \sqrt[n]{a} \sqrt[n]{b} \quad a \geq 0, b \geq 0,
\]

\[
\sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m = \left(\frac{1}{a^n}\right)^m = a^{\frac{m}{n}}, \quad \sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}} \quad a \geq 0, b > 0
\]

10. If \( a = 2 \) then evaluate, \( \sqrt[3]{a^5} + \sqrt[3]{a^8} \).