ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
SCHOOL OF NATURAL SCIENCE
DEPARTMENT OF MATHEMATICS
NUMERICAL ANALYSIS I-WORK SHEET I

1. Find the percentage error if 625.483 is approximated to three significant figures.
2. Let x = 0.00458529 find the absolute error if x is truncated to three decimal digits.
3. Let the solution of a problem be $x_A = 35.25$ with relative error in the solution atmost 2% find the range of values upto 4 decimal digits, within which the exact value of the solution must lie.
4. Find the relative error in the function $y = ax_1^{m_1}x_2^{m_2}\dots x_n^{m_n}$.
5. Find the absolute error, relative error and percentage error of the area of triangle $A = \frac{1}{2}ab$ if $a = 2.5 \pm 0.001\ cm$ & $b = 10.3 \pm 0.0001\ cm$
6. The strain in axial member of a square cross section is given by

$$\varepsilon = \frac{F}{h^2E}$$

   where: F=axial force in the member in Newton, h=width of the cross section in meter, and E=Young's modulus in Pascal.
   Given $F = 6.2 \pm 0.9N$, $h = 4 \pm 0.1m, and E = 10 \pm 0.4pa$. Find the absolute and relative errors in the measured strain.
7. Itis required to find the value of the function $U = 6x^2(\log x - \sin 2y)$ to two decimal places; the approximate value of x and y are 15.2^0 and 57^0, respectively. Find the permissible absolute error in this quantities.
8. Find the percentage error in $V(x, y) = 3x^2y$ at x = 1 and y = 1. Given that the percentage error in x and y are 1% *and* 2% respectively. Hence, by inverse method show that if the percentage error in V is 4% then the corresponding percentage error in x and y are 1% and 2% respectively.
9. Find the relative maximum error in the function
   (a) $w = \dfrac{6xy^3z^5}{u^2}\ if x = y = z = 1,\ u = 2\ \&\ \Delta x = \Delta y = \Delta z = \Delta u = 0.001$
   (b) $F = \dfrac{4x^2y^3}{z^4}\ if x = y = z = 1,\ \&\ \Delta x = \Delta y = \Delta z = 0.0001$
   (c) $U = \dfrac{x^2y}{z}\ if x = y = z = 3\ \&\ \Delta x = 0.001\ \Delta y = 0.002\ \Delta z = 0.003$
10. The value of the function $u = \dfrac{5xy^2}{z^3}$ is corrected to three decimal places & if $x = y = z = 1$, then find the permissible absolute errors in x, y & z.
11. The errors in the measurement of area of a circle is not allowed to exceed 0.5%. How accurately should the radius be measured?
12. Using bisection method solve the following equations
    (a) $f(x) = \sqrt{x} - \cos x$ on [0, 1]. Perform only the first three iteration
    (b) $x = \sqrt{5}$ correct to two decimal place.
    (c) $x^3 - 5x + 1 = 0$ find the smallest positive root correct to two decimal places.
    (d) $f(x) = 3x - \sqrt{1 + \sin x}$ correct to three decimal places.

13. Using Regula Falsi method find the smallest positive root of the equation
    (a) $x^2 - \ln x - 12 = 0$
    (b) $x^4 - x - 10 = 0$,
    (c) $x - e^{-x} = 0$
14. Using Newton-Raphson method solve the following equation
    (a) $x^4 - x - 10 = 0$ correct to three decimal places.
    (b) $x - \sin x = 0.25$ with an erorr of 0.001
    (c) $\cos x - xe^x = 0$
15. Repeat problem # 14 using Secant method.