PROBLEM SHEET – 1

Solve the following problems by writing commands in the Command Window.

1. Calculate:

   (*a*) $\dfrac{(14.8^2 + 6.5^2)}{3.8^2} + \dfrac{55}{\sqrt{2} + 14}$ (*b*) $(-3.5)^3 + \dfrac{e^6}{\ln 524} + 206^{1/3}$

2. Calculate:

   (*a*) $\dfrac{16.5^2(8.4 - \sqrt{70})}{4.3^2 - 17.3}$ (*b*) $\dfrac{5.2^3 - 6.4^2 + 3}{1.6^8 - 2} + \left(\dfrac{13.3}{5}\right)^{1.5}$

3. Calculate:

   (*a*) $15\left(\dfrac{\sqrt{10} + 3.7^2}{\log_{10}(1365) + 1.9}\right)$ (*b*) $\dfrac{2.5^3\left(16 - \dfrac{216}{22}\right)}{1.7^4 + 14} + \sqrt[4]{2050}$

4. Calculate:

   (*a*) $\dfrac{2.3^2 \cdot 1.7}{\sqrt{(1 - 0.8^2)^2 + (2 - \sqrt{0.87})^2}}$ (*b*) $2.34 + \dfrac{1}{2}2.7(5.9^2 - 2.4^2) + 9.8\ln 51$

5. Calculate:

   (*a*) $\dfrac{\sin\left(\dfrac{7\pi}{9}\right)}{\cos^2\left(\dfrac{5}{7}\pi\right)} + \dfrac{1}{7}\tan\left(\dfrac{5}{12}\pi\right)$ (*b*) $\dfrac{\tan 64^\circ}{\cos^2 14^\circ} - \dfrac{3\sin 80^\circ}{\sqrt[3]{0.9}} + \dfrac{\cos 55^\circ}{\sin 11^\circ}$

6. Define the variable x as $x = 2.34$, then evaluate:

   (*a*) $2x^4 - 6x^3 + 14.8x^2 + 9.1$ (*b*) $\dfrac{e^{2x}}{\sqrt{14 + x^2 - x}}$

7. Define the variable t as $t = 6.8$, then evaluate:

   (*a*) $\ln(|t^2 - t^3|)$ (*b*) $\dfrac{75}{2t}\cos(0.8t - 3)$

8. Define the variables x and y as $x = 8.3$ and $y = 2.4$, then evaluate:

   (*a*) $x^2 + y^2 - \dfrac{x^2}{y^2}$ (*b*) $\sqrt{xy} - \sqrt{x + y} + \left(\dfrac{x - y}{x - 2y}\right)^2 - \sqrt{\dfrac{x}{y}}$

9. Define the variables a, b, c, and d as:

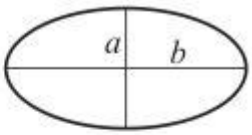
   $a = 13$, $b = 4.2$, $c = (4b)/a$, and $d = \dfrac{abc}{a + b + c}$, then evaluate:

   (*a*) $a\dfrac{b}{c + d} + \dfrac{da}{cb} - (a - b^2)(c + d)$ (*b*) $\dfrac{\sqrt{a^2 + b^2}}{(d - c)} + \ln(|b - a + c - d|)$

10.

Given: $\int \cos^2(ax)dx = \frac{1}{2}x - \frac{\sin 2ax}{4a}$. Use MATLAB to calculate the following definite integral: $\int_{\frac{\pi}{9}}^{\frac{3\pi}{5}} \cos^2(0.5x)dx$.

11. The perimeter P of an ellipse with semi-minor axes a and b is given approximately by: $P = 2\pi\sqrt{\frac{1}{2}(a^2 + b^2)}$.



(a) Determine the perimeter of an ellipse with $a = 9$ in. and $b = 3$ in.

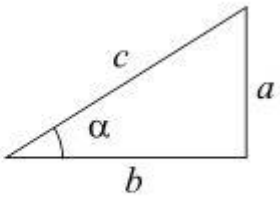
(b) An ellipse with $b = 2a$ has a perimeter of $P = 20$ cm. Determine a and b.

12. Two trigonometric identities are given by:

(a) $\sin 4x = 4\sin x\cos x - 8\sin^3 x\cos x$ (b) $\cos 2x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$

For each part, verify that the identity is correct by calculating the values of the left and right sides of the equation, substituting $x = \frac{\pi}{9}$.

13. . In the right triangle shown $a = 16$ cm and $c = 50$ cm. Define a and c as variables, and then:



(a) Using the Pythagorean Theorem, calculate b by typing one line in the Command Window.

(b) Using b from part (a) and the `acosd` function, calculate the angle α in degrees by typing one line in the Command Window.

14.

The distance d from a point (x_0, y_0, z_0) to a plane $Ax + By + Cz + D = 0$ is given by:

$$d = \frac{|Ax_0 + By_0 + Cz_0 + D|}{\sqrt{A^2 + B^2 + C^2}}$$

Determine the distance of the point $(8, 3, -10)$ from the plane $2x + 23y + 13z - 24 = 0$. First define the variables A, B, C, D, x_0, y_0, and z_0, and then calculate d.