Introduction To Engineering – Assignment - **04**

#	Student ID	Student Name	Grade (10)
-			

Delivery Date	

١. يتم تسليم التمرين محلولا في خلال أسبوع من تاريخ التمرين، و يتم حذف درجتين من التمرين عن كل أسبوع تأخير
٢. يتم التسليم لمعيد المقرر مباشرة
٣. تتم أجابه التمرين في نفس ورق الأسئلة

Q1	Show that $\lim_{x \to 1} \frac{x^{1/3} - 1}{x^{1/4} - 1} = \frac{4}{3}$. Do this by first creating a vector x that has the elements 2.0, 1.5, 1.1, 1.01, 1.001, 1.00001, and 1.0000001.
Sol 1	.....

Q2

Create the following three matrices:

$$A = \begin{bmatrix} 1 & -3 & 5 \\ 2 & 2 & 4 \\ -2 & 0 & 6 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & -2 & 1 \\ 5 & 1 & -6 \\ 2 & 7 & -1 \end{bmatrix} \qquad C = \begin{bmatrix} -3 & 4 & -1 \\ 0 & 8 & 2 \\ -3 & 5 & 3 \end{bmatrix}$$

Use the matrices A, B, and C from the previous problem to answer the following:

(*a*) Does $A*B = B*A$?

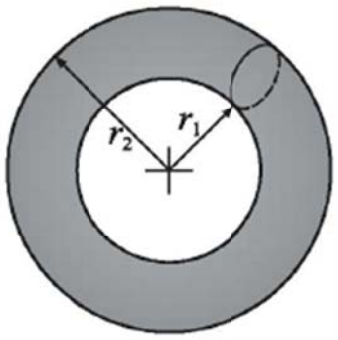
(*b*) Does $A*(B*C) = (A*B)*C$?

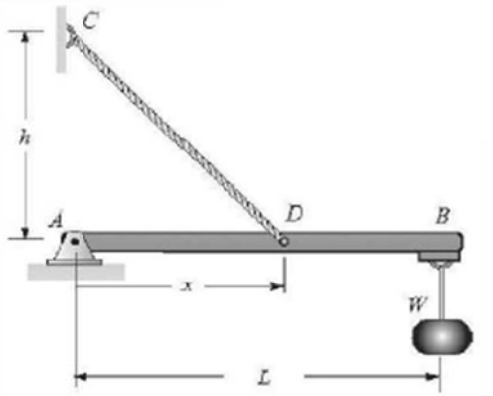
(*c*) Does $(A*B)^t = A^t*B^t$? (^{t} means transpose)

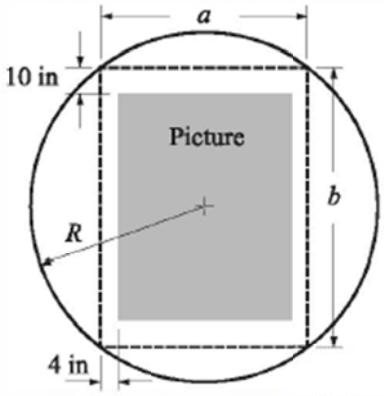
(*d*) Does $(A + B)^t = A^t + B^t$?

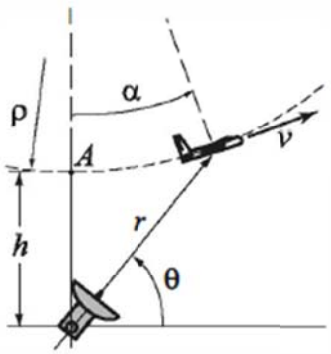
Sol 2

Q3	Solve the following system of five linear equations: $2.5a - b + 3c + 1.5d - 2e = 57.1$ $3a + 4b - 2c + 2.5d - e = 27.6$ $-4a + 3b + c - 6d + 2e = -81.2$ $2a + 3b + c - 2.5d + 4e = -22.2$ $a + 2b + 5c - 3d + 4e = -12.2$
Sol 3	.....

Q4	The volume V and the surface area S of a torus-shaped water tube are given by: $V = \frac{1}{4}\pi^2(r_1 + r_2)(r_2 - r_1)^2$ and $S = \pi^2(r_2^2 - r_1^2)$ If $r_1 = 0.7r_2$, determine V and S for r_2 = 12, 16, 20, 24, and 28 in. Display the results in a four-column table where the first column is r_2, the second r_1, the third V, and the fourth S. 
Sol 4	.....

Q5	A beam with a length L is attached to the wall with a cable as shown. A load $W = 500$ lb is attached to the beam. The tension force, T, in the cable is given by: $$T = \frac{WL\sqrt{h^2 + x^2}}{hx}$$ For a beam with $L = 120$ in. and $h = 50$ in., calculate T for $x = 10, 30, 50, 70, 90$, and 110 in. 
Sol 5	.....

Q6	A round billboard with radius $R = 55$ in. is designed to have a rectangular picture placed inside a rectangle with sides a and b. The margins between the rectangle and the picture are 10 in. at the top and bottom and 4 in. at each side. Write a MATLAB program that determines the dimensions a and b such that the overall area of the picture will be as large as possible. In the program define a vector a with values ranging from 5 to 100 with increments of 0.25. Use this vector for calculating the corresponding values of b and the overall area of the picture. Then use MATLAB's built-in function max to find the dimensions of the largest rectangle. 
Sol 6	.....

Q7	The airplane shown is flying at a constant speed of $v = 50$ m/s in a circular path of radius $\rho = 2000$ m and is being tracked by a radar station positioned a distance $h = 500$ m below the bottom of the plane path (point A). The airplane is at point A at $t = 0$, and the angle α as a function of time is given (in radians) by $\alpha = \frac{v}{\rho}t$. Write a MATLAB program that calculates θ and r as functions of time. The program should first determine the time at which $\alpha = 90°$. Then construct a vector t having 15 elements over the interval $0 \le t \le t_{90°}$, and calculate θ and r at each time. The program should print the values of ρ, h, and v, followed by a 15×3 table where the first column is t, the second is the angle θ in degrees, and the third is the corresponding value of r. 
Sol 7	.....

Q8	The graph of the function $f(x) = ax^3 + bx^2 + cx + d$ passes through the points (–2.6, –68), (0.5, 5.7), (1.5, 4.9), and (3.5, 88). Determine the constants a, b, c, and d. (Write a system of four equations with four unknowns, and use MATLAB to solve the equations.)
Sol 8	.....