Homework 1

Instructions:

One problem per Excel Worksheet, all sheets in the same Workbook
Label each problem at the start
Once your Excel Workbook file is complete, save it and turn in the Excel File (.XLSX)
Name your file lastname_firstname_HW#
ONLY TURN IN ONE FILE

When using Goal Seek or Solver YOU MUST SHOW YOUR WORK BEFORE AND AFTER applying the function.

Problem 1. A projectile is launched at an angle of 55 degrees from the horizontal with a velocity of 30m/s. Neglecting air resistance and assuming a horizontal surface, determine the following:

a. How far away from the launch site the projectile will land.
b. The maximum height the projectile will reach. (Hint: Max height is reached at half the time of flight)

Problem 2. Create a table that shows the conversion of degrees to radians for 0-360 degrees counting by 10 degrees. Show a table and XY scatter plot with a trend line and equations, axis labels and a title.

Problem 3. You are buying a car that costs $15,000. The bank secured a loan at 6% interest, which you have to pay off in 60 months.
a. Calculate the monthly payment using the built in PMT function.
b. You find the payment in part (a) to be too high. You can afford only a monthly payment of $225. How many monthly payments of $225 will you need to make until the loan is paid off? (Use Goal Seek).

Problem 4. A "stiff" spring is one that gets stronger the more it is compressed, unlike a linear spring for which the spring constant is constant. Suppose the force in a stiff spring is defined by the function $F(x) = kx+mx^3$, where x is the amount of compression, k= 500 N/m and m=10,000 N/m^3. Using the Solver function, find the compression x (meters) of the spring if a force of 250 N is applied.

Problem 5. Use Excel Solver function to find a local maximum of the following function:

$x^4-x^3-7x^2+x+6$. Show your work before and after.

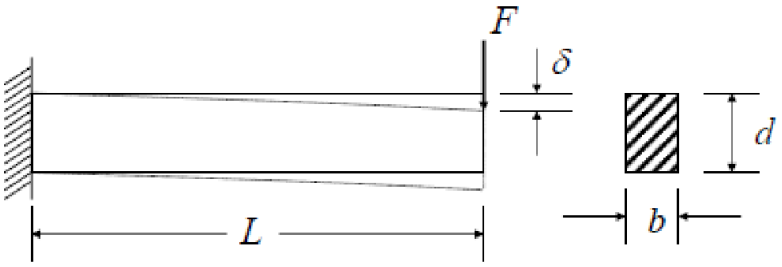
Problem 6. Your boss at NASA has asked you to design a cylindrical tank for storing cryogenic propellant. The tank should be able to hold 2000 liters of the propellant. The tank should have minimum possible surface area to minimize heat transfer with the surroundings. Use Solver function to determine the radius (r) and height (h) of the tank.

Total surface area of a cylinder $= 2\pi r.\left(r+h\right)$

Volume of a cylinder $= \pi r^2 h$

Problem 7. Use the following information and Goal Seek to find what value of d gives a deflection of 1mm. Your results should look like the sample below the problem description. Use the convert function for ALL unit conversions.

Deflection of cantilever beam



$$\delta = \frac{F \cdot L^3}{3 \cdot E \cdot I} \qquad I = \frac{b \cdot d^3}{12}$$

E modulus of elasticity

I moment of inertia

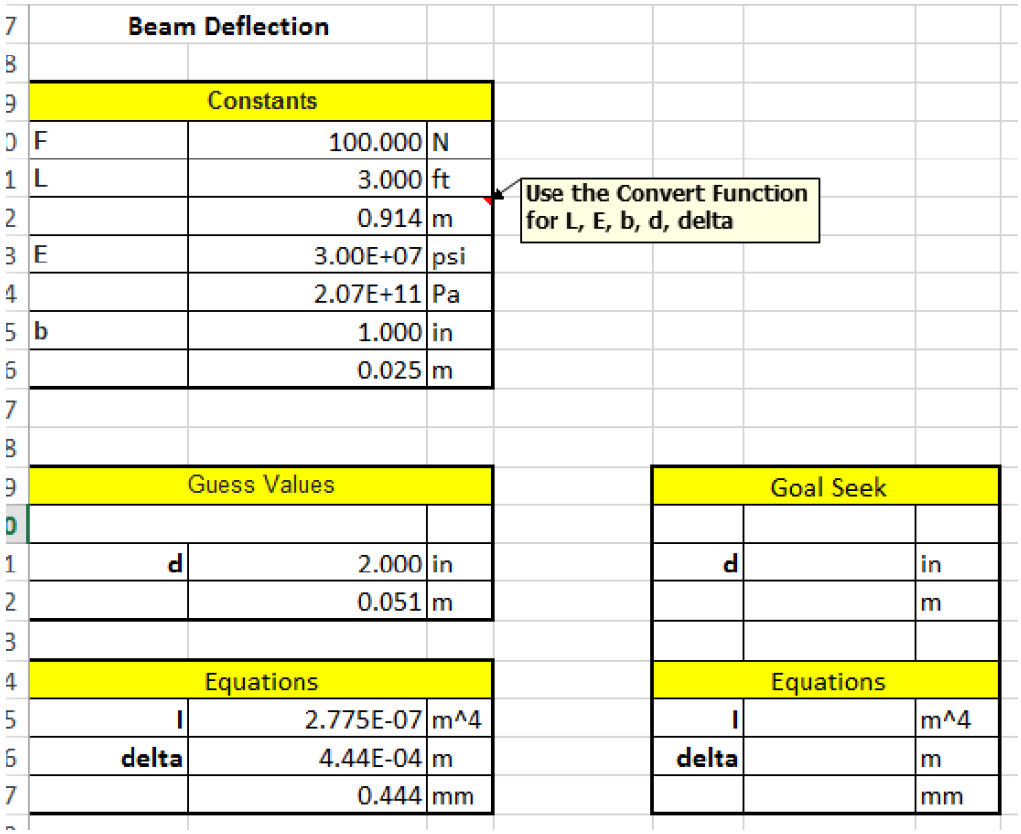
F = 100 N

L = 3 ft

E = 30x10^6 psi

b = 1 in

What value of d gives a deflection, δ, of 1 mm?



Beam Deflection								
Constants								
F		100.000	N					
L		3.000	ft					
		0.914	m					
E		3.00E+07	psi					
		2.07E+11	Pa					
b		1.000	in					
		0.025	m					
Guess Values						Goal Seek		
d		2.000	in			d		in
		0.051	m					m
Equations						Equations		
I		2.775E-07	m^4			I		m^4
delta		4.44E-04	m			delta		m
		0.444	mm					mm

Use the Convert Function for L, E, b, d, delta

Problem 8: Grades

The equivalent letter grades for numerical values of points is given in the table below.

Points	Letter Grade
100-90	A
89-80	B
79-70	C
69-60	D
Less than 60	F

Create an Excel sheet identical to the one below which uses a nested IF statement to determine the letter grade that goes with the corresponding numercial value. You must use the values given in column A.

	A	B
1	Numerical Value	Letter Grade
2	95	A
3	85	B
4	82	B
5	75	C
6	70	C
7	69	D
8	65	D
9	45	F

Problem 9: Resistance

		Enter Resistor values	Connection Type	Resistance
5	R1	1	series	15.00
6	R2	2	parallel	0.44
7	R3	3		
8	R4	4		
9	R5	5		

This is an IF statement calculating resistance based on whether the resistors are in

Create an Excel worksheet identical to this one which computes resistance for 5 resistors that are connected in series and parallel. You must use an IF statement to calculate resistance in order to receive credit. You do not need to include the comments, problem statement or picture below in your solution.

Electrical resistors are said to be connected "in series" if the same current passes through each and "in parallel" if the same voltage is applied across each. If in series, they are equivalent to a single resistor whose resistance is given by

$$R = R_1 + R_2 + R_3 + \cdots + R_n$$

If in parallel, their equivalent resistance is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_n}$$