City University
School of Engineering and Mathematical Sciences
Common Part 1

AE1263

Coursework – Excel

- *Use a separate worksheet for each answer within a single file (CW_your_name.xls).*
- *Write your name, group and email address on each worksheet.*
- *Assessment includes **correctness** and **presentation** of the equations, tables and the graphs.*
- *Q1 must be completed by 13:00, 8/2/2010 before the class starts. This question is marked in class.*
- *Q3 must be completed by 13:00, 15/2/2010 before the class starts. This question is marked in class.*
- *Submit CW_your_name.xls to CitySpace by 1/3/2010*
- *Late submission: Q1 and Q3 - no late submission is allowed*
  Other questions – up to 1 week late, capped at 59%
  – up to 2 weeks late, capped at 40%
  – later than 2 weeks, registered as non-submission

Q1 [20 marks]
Construct a worksheet as shown to display the pressure of a gas at various temperatures and volumes using the van der Waals equation:

$$P = \frac{RT}{V-b} - \frac{a}{V^2}$$

Correct cell references should be used, so that the formula is entered in one cell and copied to the rest cells of the table

	A	B	C	D	E	F	G	H
1	van der Waals Equation of State							
2								
3		Gas	R	a	b		$P = \frac{RT}{V-b} - \frac{a}{V^2}$	
4		CO_2	0.08206	3.59	0.0427			
5								
6	Pressure in atmospheres at varying T and V							
7	Volume (L)	Temperature (K)						
8		250	260	270	280	290	300	310
9	0.05	1374.21	1486.61	1599.02	1711.43	1823.84	1936.25	2048.65
10	0.10	-0.98	13.34	27.66	41.98	56.30	70.62	84.94
11	0.15	31.63	39.28	46.93	54.58	62.22	69.87	77.52
12	0.20	40.67	45.88	51.10	56.32	61.53	66.75	71.97
13	0.25	41.52	45.48	49.44	53.40	57.35	61.31	65.27
14	0.30	39.84	43.03	46.22	49.41	52.60	55.79	58.98
15	0.35	37.45	40.12	42.79	45.46	48.13	50.80	53.47
16	0.40	34.98	37.27	39.57	41.87	44.16	46.46	48.76
17	0.45	32.64	34.65	36.67	38.68	40.70	42.71	44.73
18	0.50	30.50	32.29	34.09	35.88	37.68	39.47	41.27

Video demonstration is available online.

Key Steps:

- Merge cells A1:H1 for the title
- Enter the values in B8:H8 and in A9:A18 using the Series Fill method
- In B9 enter the formula =(C4*B8)/(A9-E4)-D4/(A9*A9).
- Copy B9 to C9, see the change in formula in C9.
- Undo the copy, modify B9 using mixed and absolute reference.
- Copy B9 to the range B9:H18
- Format the cells to improve the appearance.

In-class marking: This question is marked in class on 8/2/2010. You should construct the table before the class starts. First part of assessment is the correctness and presentation of the table. Second part of assessment is for you to re-construct the table or part of the table; and answer some questions regarding cell references.

Q2 [15 marks] Construct a worksheet to display the mass of a cylinder with radius varies from 1 cm to 10 cm at every 1 cm and length varies from 10 cm to 20 cm at every 5 cm. The density is 7.8 kg/m^3.

$$m = \rho \pi r^2 L$$

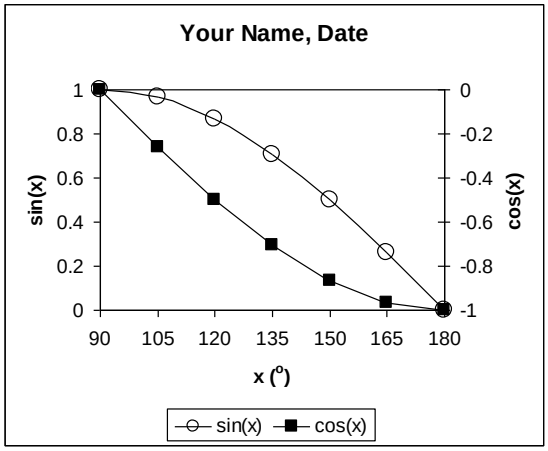
Correct cell references should be used, so that the formula is entered in one cell and copied to the rest cells of the table.

Q3 [20 marks]
Use Microsoft Excel to re-produce the graph shown below. The task includes

1) calculating function y = sin(x) and y=cos(x) for $90^\circ \le x \le 180^\circ$ in step of 15°
2) plotting the two functions (The graph must be black and white, i.e. no colours in the graph)

Notes:

- Write your name and date in the chart title
- Use two y axes for the two functions



Video demonstration is available online.

In-class marking: This question is marked in class on 15/2/2010. You should construct the sheet before the class starts. First part of assessment is the correctness and presentation of the sheet. Second part of assessment is for you to re-construct the graph or part of the graph; and answer some questions regarding chart in Excel.

Q4 [15 marks]

A water pipe has varying diameters. Diameters at 10 locations are shown in the table below, where x is the location and d is the diameter.

1) Copy the table to a worksheet; complete the table using the given formulas in the table (correct cell references should be used);
2) Plot the two curves, i.e., d_1/d versus x and $1-(d_1/d)^4$ versus x on a single chart

d_1: diameter at the 1st location

No.	1	2	3	4	5	6	7	8	9	10
x (mm)	0	80	122	164	238	312	386	460	534	607
d (mm)	41	41	28	15.5	21.4	27.8	34.1	40.5	40.5	40.5
d_1/d										
$1-(d_1/d)^4$										

Q5 [10 marks]

Design a worksheet to solve a quadratic equation in the form $ax^2+bx+c=0$ using the quadratic formula: $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

The quantity $\sqrt{b^2-4ac}$ is called the discriminant which determines the number (0, 1 or 2) of real roots of the equation.

	A	B	C	D	E	F	G	H	I
1	Design a worksheet to solve a quadratic equation in the form using the quadratic formula:								
2									
3		$ax^2+bx+c=0$			$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$				
4									
5									
6	Quadratic Equation Solver								
7	a	b	c		disc				
8	1	5	6		1				
9									
10	Number of real roots		2						
11	Root 1	-2	Root 2	-3					
12									

Video demonstration is available online.

Key Steps:

- Formula in E8: =B8^2-4*A8*C8
- Formula in C10: =IF(E8<0,0,IF(E8=0,1,2))
- Formula in A11: =IF(C10=1,"Double Root",IF(C10=2,"Root 1",""))
- Formula in C11: =IF(C10=2,"Root 2","")
- Formula in B11: =IF(E8>=0, (-B8+SQRT(E8))/(2*A8),"")
- Formula in D11: =IF(E8>0,(-B8-SQRT(E8))/(2*A8),"")

Test the solver with different values of a, b and c. For example:

Quadratic Equation Solver				
a	b	c		disc
1	1	1		-3
Number of real roots		0		

Quadratic Equation Solver				
a	b	c		disc
1	-2	1		0
Number of real roots		1		
Double Ro	1			

Q6 [15 marks]

Construct a worksheet to calculate function $y = \begin{cases} A \cdot \dfrac{\sin(x)}{x} & x \neq 0 \\ A & x = 0 \end{cases}$

for *x* between -1 and 1 with increment of 0.2. *A* is a constant in a cell and initial value of *A* is 10. Plot the function on an XY chart.

Q7 [5 marks]

This question is to use cell names to replace cell references with $ signs in Q1. Copy Q1 to a new sheet. Assign names to the cells which store the three constants in the equation; also name the temperature range and the volume range. Use those names to replace the absolute and the mixed cell references, i.e. the cell references with $ sign(s), in the formulas.

Note: The three names for the constants should be yourname1, yourname2 and yourname3. For example, student John Smith should use smith1, smith2 and smith3 for the three constants *R*, *a* and *b* in the equation. Names for the temperature range and the volume range are for you to decide.