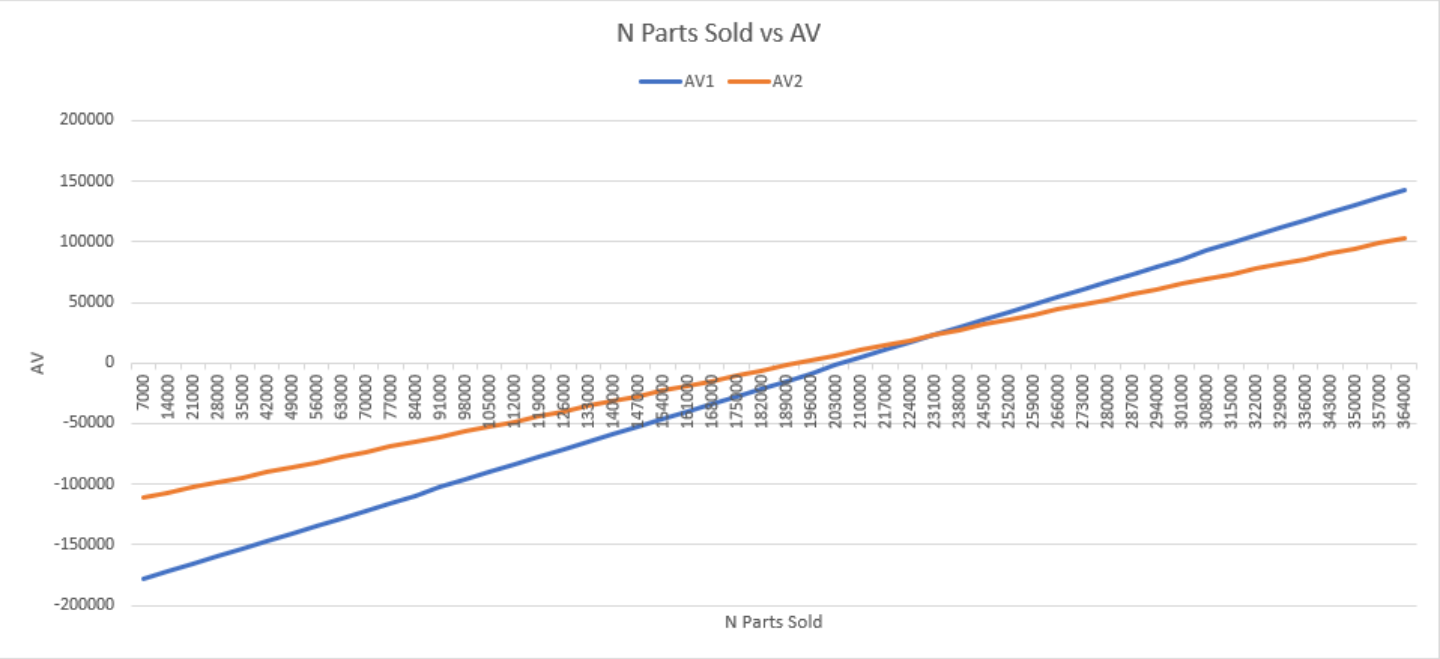
MECH 5760 Chapter 5 Assignment #4
Name: Kunal Nandanwar
UML ID: 02049382

5.3f) Breakeven Analysis
Automatic machine → Cost = $800,000, 10 cents/cell cost
Semi-automatic machine → Cost = $500,000, 40 cents/cell cost

Selling cost = $1/unit

Profit of automatic machine = $1 - $0.1 = $0.9/part
Profit of semi-automatic machine = $1 - $0.4 = $0.6/part

Assume NO salvage value, interest rate = 5%, 5-year life
AV_1 = -800000(A/P, 5%, n = 5) + 0.9N = -800000(0.231) + 0.9N = -184800 + 0.9N
AV_2 = -500000(A/P, 5%, n = 5) + 0.6N = -500000(0.231) + 0.6N = -115500 + 0.6N
Breakeven is when $AV_1 = AV_2$ and solve for N pieces
N = 231,000 pieces
To demonstrate the breakeven analysis graphically, please generate a graph (Figure 1) based on a range of x values (N parts sold) versus Y values from both machines (AV1 and AV2)



5.3g) Probabilistic Analysis
Semi-automatic machine → Cost = $500,000, Interest rate = 5%, 5-year life, NO salvage value, NO Taxes, 120,000 cells/year
P (B = $0.8) = 0.8
P (B = $1) = 0.2
P (n = 4) = 0.6
P (n = 5) = 0.4

Given B = $0.8/cell, the benefit would be 120000 * 0.8 = $96,000
PV level 1 = -500000 + 96000*3.546 = $(159,584)
PV Compound level 1 = $(159,584) * 0.48 = $ (76,600)

Given B = $0.8/cell, the benefit would be 120000 * 0.8 = $96,000
PV level 2 = -500000 + 96000*4.329 = $(84,416)
PV Compound level 2 = $(84,416) * 0.32 = $ (27,013)

Given B = $1/cell, the benefit would be 120000 * 1 = $120,000
PV level 3 = -500000 + 120000 * (P/A, 5%, n = 4) → -500000 + 120000 * (3.546) = $(74,480)
PV Compound level 3 = $ (74,480) * 0.12 = $ (8937.6)

Given B = $1/cell, the benefit would be 120000 * 1 = $120,000
PV level 4 = -500000 + 120000 * (P/A, 5%, n = 5) → -500000 + 120000 * (4.329) = $19,480
PV Compound level 4 = $ (19,480) * 0.08 = $1558.4

Please complete the Table 2 for Levels 2 and 4.

Table 1: Probabilistic Analysis Calculations

Benefits/ Cell	Probability (Benefits)	Actual Profits/Y	Years (n)	Probability (Years)	Probability (B*n)	P (A,5%, n)	PV Each Level	PV Compound
$0.80	0.8	$96,000	4	0.6	0.48	3.546	$(159,584)	$ (76,600)
$0.80	0.8	$96,000	5	0.4	0.32	4.329	$(159,584)	$(27,013)
$1.00	0.2	$120,000	4	0.6	0.12	3.546	$(74,480)	$ (8,937.6)
$1.00	0.2	$120,000	5	0.4	0.08	4.329	$19,480	$1,558.4
Total	2			2	1			$(110,992)

5.3h) Sensitivity Analysis
Semi-automatic machine → Interest rate = 5%, cost = $500,000, 120,000 cells/year @ $1 profit/cell, 5-year life
Current Machine cost = $500,000
Current profit = 120,000 * 1 = $120,000/year, current Useful Life = 5 Years

PV = -500000 + (B = 96000, 120000, 144000) * (P/A, 5%, n = 4, 5, 6)

PV_1 = -500000 + 96000 * (P/A, 5%, n = 4) = -500000 + 96000 * 3.546 = **$ (159,584)**
PV_2 = -500000 + 96000 * (P/A, 5%, n = 5) = -500000 + 96000 * 4.329 = **$ (84,416)**
PV_3 = -500000 + 96000 * (P/A, 5%, n = 6) = -500000 + 96000 * 5.076 = **$ (12,704)**
PV_4 = -500000 + 120000 * (P/A, 5%, n = 4) = -500000 + 120000 * 3.546 = **$ (74,480)**
PV_5 = -$500,000 + $120000 * (P/A, 5%, n = 5) = -500000 + 120000 * 4.329 = **$19,480**
PV_6 = -$500,000 + $120000 * (P/A, 5%, n = 5) = -500000 + 120000 * 5.076 = **$109,120**
PV_7 = -500000 + 144000 * (P/A, 5%, n = 4) = -500000 + 144000 * 3.546 = **$10,624**
PV_8 = -500000 + 144000 * (P/A, 5%, n = 4) = -500000 + 144000 * 4.329 = **$123,376**
PV_9 = -500000 + 144000 * (P/A, 5%, n = 4) = -500000 + 144000 * 5.076 = **$230,944**

Please fill out the rest of Table 2 below.

Table 2: Sensitivity Analysis Calculations

% Change Benefits	Resulting Benefits	% Change Years	Life (years)	PV	Row Number
-20	$96,000	-20	4	-$(159,584)	PV 1
-20	$96,000	0	5	-$(84,416)	PV 2
-20	$96,000	20	6	-$(12,704)	PV 3
0	$120,000	-20	4	-$ (74,480)	PV 4
0	$120,000	0	5	$19,480	PV 5
0	$120,000	20	6	$109120	PV 6
20	$144,000	-20	4	$10,624	PV 7
20	$144,000	0	5	$123,376	PV 8
20	$144,000	20	6	$230,944	PV 9

As seen from Table 2, the nominal value (0% change for both benefits and life) = $19,480.

Taking the averages,
For -20% Benefit, Average = (AV 1 + AV 2 + AV3) / 3 = (-159594 – 84416 – 12704) / 3 = $ (85,568)
For Current Benefit, Average = (AV 4 + AV 5 + AV6) / 3 = (-74480 + 19480 + 109120) / 3 = $18,040
For +20% Benefit, Average = (AV 7 + AV 8 + AV9) / 3 = (10624 + 123376 + 230944) / 3 = $121,648
For -20% Useful Life, Average = (AV 1 + AV 4 + AV7) / 3 = (-159594 – 74408 + 10624) / 3 = $ (74,480)
For Current Useful Life, Average = (AV 2 + AV 5 + AV8) / 3 = (-84416 + 19480 + 123376) / 3 = $19,480
For +20% Useful Life, Average = (AV 3 + AV 6 + AV9) / 3 = (-12704 + 109120 + 230944) / 3 = $109,120

Please present these in a graph with three levels of Benefits and three levels of Life.

To Plot Figure 2 like graph in the textbook, in Excel, assign the three levels of Benefits then years in one column of 6 rows for x, and two successive columns of three rows each for Benefits and life.

Figure 2: Sensitivity Analysis Graph