DARPA is planning to purchase a new machine. The initial investment required for this is $60,000. The machine will yield $1500 in revenue annually for 6 years while an O & M expense of $500 is required every year of the machine's life. The machine is resold for $17,000 at the end of 6 years. Draw the cash flow diagram. Assume the EOP discrete cash flows. [5 points]

Investment	$60,000.00
Revenue	$ 1,500.00
O & M	$ 500.00
N	6
Salvage	$17,000.00

S = $17,000

Revenue = $1,500/Year

| 1 | 2 | 3 | 4 | 5 | 6 |

O & M = $500/Year

I = $60,000
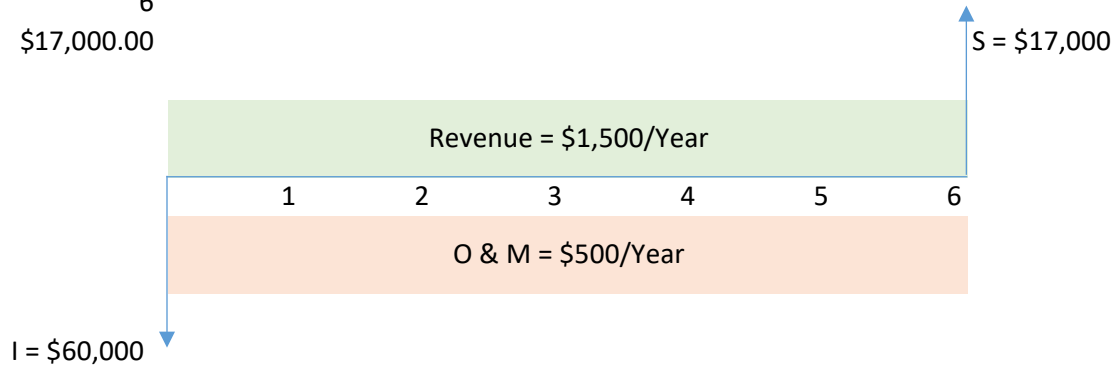
You plan to buy $500,000 home with a 15% down payment. The bank you want to finance the loan suggests two options: a 25-year mortgage at 10% APR and a 35 year mortgage at 11% APR. What is the difference in monthly payments (for the first 20 years) between these two options? [3 points]

Price	$500,000.00		
DP	$ 75,000.00		
Pending	$425,000.00		
APR		10%	11%
N		25	35
Payment		$ (3,861.98)	$(3,982.07)
Difference	$	(120.09)	

APR with 10% is a better option then 11% for this loan

Mario Batali borrowed $90,000 from a bank at an interest rate of 12% compounded monthly. The loan will be repaid in 48 monthly installments over four years. Immediately after his 20th payment, Mario desires to pay the remainder of the loan in a single payment. Compute the amount he must pay in a single payment amount after his 20th payment. [2 points]

P	$90,000.00	
N	48	
I	12%	1% (Monthly)

$ (2,370.05) Monthly Payments

$57,631.07   Amount to be paid after 20th Installment

Money is rather tight this month (student life!), and so you decide to borrow $1,900 from YoLoS (Your Loan Shark Inc). They are willing to lend you $1,900 if you repay them $2,100 a month later.

a. What is the nominal annual interest rate that you are being charged? [3 points]

b. What is the effective annual interest rate that you are being charged? Assume monthly compounding. [2 points]

Interest	10.53%		
PV	$1,900.00		
FV	$2,100.00		
Nominal	r=	1.263158 OR	126%
Effective	Ia=	2.323444 OR	232%

Springhedd Inc. is planning to purchase a new data server for their data management. They are toying between two alternative servers – IBM and Sun. Listed below are the economic details of the alternatives,

	Alternative A	Alternative B
Initial Investment	$(460,000.00)	$(480,000.00)
Annual Revenue	$ 140,000.00	$ 150,000.00
Annual Expenses	$ (92,000.00)	$(115,000.00)
Salvage Value	$ 115,000.00	$ 160,000.00
Interest Rate	10%	10%
N	7	7
Effective	$ 48,000.00	$ 35,000.00

a. For the two locations,
Calculate the PW (DO NOT use the AW or FW values); [2 points]
Calculate the AW (DO NOT use the PW or FW values); [2 points]
Calculate the FW (DO NOT use the PW or AW values) [2 points]
b. Which alternative should they choose? Why? [1 point]

PW	=-P+A(P/A,I,N)+F(P/F,I,N) =-460000+48000(P/A,10,7)+115000(P/F,10,7) $ 167,298.80
AE	=-P(A/P,i,N)+A+F(A/F,i,N) =-460000(A/P,10,7)+48000+115000(A/F,10,7) $ (34,363.00)
FW	=-P(F/P,I,N)+A(F/A,I,N)+F =-460000(F/P,10,7)+48000(F/A,10,7)+115000 $ (326,016.40)

ALTERNATIVE A (PICK)

PW	=-P+A(P/A,I,N)+F(P/F,I,N) =-480000+35000(P/A,10,7)+160000(P/F,10,7) $ (227,494.00)
AE	=-P(A/P,i,N)+A+F(A/F,i,N) =-480000(A/P,10,7)+35000+160000(A/F,10,7) $ (42,620.00)
FW	=-P(F/P,I,N)+A(F/A,I,N)+F =-480000(F/P,10,7)+35000(F/A,10,7)+160000 $ (443,324.00)

ALTERNATIVE B

Alternative A's PW is greater then B's, A is a better option

Find the EUAC for a machine whose initial investment is $70,000, the annual expense incurred is $40,000 The annual revenue generated from the machine is $60,000and the salvage value is $9,000. Use MARR of 20% and the useful life of the machine to be 12 years [2 points]

Investment	$(70,000.00)
Expense	$(40,000.00)
Revenue	$ 60,000.00
A	$ 20,000.00
N	12
MARR	20%
Salvage	$ 9,000.00

CR	$(87,798.70)
OM	$ 20,000.00
EUAC	$(67,798.70)

Jack's Warehouse is looking into automating their storage system, and they will need fewer workers as a result. The details are noted below:

Initial Cost	$(700,000.00)
Yearly Savings	$ 190,000.00
Service Life	10

What is the IRR for this new machine? [5 points]
Note: Please use interpolation (and NOT Excel®) to find the solution.

GUESS 1 - 20%
PW = - P + A(P|A, i, N)
- 700000 + [190000 * 4.1925]
$ 96,575.00

GUESS 2 - 25%
PW = - P + A(P|A, i, N)
- 700000 + [190000 * 3.5705]
$ (21,605.00)

Interpolation

$$y = y1 + [(x - x1)(y2 - y1)] / (x2 - x1)$$

IRR	24.09%

The NY State Govt. is planning a hydraulic project for a levee. In addition to producing electric power, this project will provide flood control, irrigation and recreational benefits. The estimated benefits and costs expected to be derived from the two alternatives are as follows:

	Alternative A	Alternative B
Initial Cost	$ 15,000,000.00	$ 22,000,000.00
Annual Flood Control Savings	$ 500,000.00	$ 750,000.00
Annual Irrigation Benefits	$ 650,000.00	$ 900,000.00
Annual Recreation Benefits	$ 300,000.00	$ 500,000.00
Annual Additional Benefits	$ 1,800,000.00	$ 2,700,000.00
O & M	$ 400,000.00	$ 550,000.00
i	12%	12%
N	50	50

The interest rate is 12% and the lives of the projects are estimated to be 50 years.
a. Calculate the benefit-cost ratio (BCR) for each alternative. [2 + 2 points]

	Alternative A	Alternative B
Benefits (B)	$ 3,250,000.00	$ 4,850,000.00
C'	$ 400,000.00	$ 550,000.00
I	$ 15,000,000.00	$ 22,000,000.00
PW of B = A(P|A, 12%, 50)		
= A*8.3045		
PW of B =	$ 26,989,620.09	$ 40,276,817.67
PW of C' =	$ 3,321,799.40	$ 4,567,474.17
PW of I =	$ 15,000,000.00	$ 22,000,000.00
PWc = I + C' = C	$ 18,321,799.40	$ 26,567,474.17
BCR = B/(I+C')	1.47308785	1.51601983
IF BCR > 1 - Accept, Else Reject	Accept	Accept

b. Select the best alternative on the basis of BCR [3 points]

I + C' of Alternative B is higher

BCR(i) B-A = (BB - BA) / (CB - CA)   1.61

Since BCR$_{B-A}$ is > 1; choose Alternative B

A CO2 laser cutter acquired in the beginning of the fiscal year at a cost of $ 32,000 has
an estimated salvage value of $ 6,500 and an estimated useful life of 5 years. Determine:

I	$32,000.00
S	$ 6,500.00
N	5

a. The amount of annual depreciation by straight line method [2 points]

n	Dn	BVn	
0		$32,000.00	$Dn = (I-S)/N$
1	$ 5,100.00	$26,900.00	
2	$ 5,100.00	$21,800.00	
3	$ 5,100.00	$16,700.00	
4	$ 5,100.00	$11,600.00	
5	$ 5,100.00	$ 6,500.00	

b. The amount of annual depreciation using the DDB method [2 points]

α   0.4 DDB

n	α	Dn	BVn	
0			$32,000.00	Dn for DDB =
1	0.4	$12,800.00	$19,200.00	$\alpha * I * [(1 - \alpha)^{(n-1)}]$
2	0.4	$ 7,680.00	$11,520.00	
3	0.4	$ 4,608.00	$ 6,912.00	
4	0.4	$ 2,764.80	$ 4,147.20	
5	0.4	$ 1,658.88	$ 2,488.32	

A machine is to be purchased for $50,000. The entire amount is to be borrowed with the stipulation that it has to be repaid at the end of two years, which is the life of the project, at 13% compounded annually. The machine is expected to provide an annual revenue of $5,000 for three years and is to be depreciated using a MACRS rate of 0.4500 in year 1 and 0.5500 in year 2. The working capital required is $13,000 and is fully recovered at the end of year 2. The cash expense for the machine is $300 per year. The salvage value of the machine at the end of the second year is expected to be $9,000. Assume a income tax rate of 30% and a MARR of 18%. Based on the data provided above, determine the following:

Investment	$	50,000.00
i		13%
N		2
Revenue	$	5,000.00 for 3 years
Working Capital	$	13,000.00
Expense	$	300.00 per year
Salvage	$	9,000.00
Income Tax		30%
MARR		18%

a. A loan amortization table determining the principal payment, the interest expenses and the annual payment. [2 points]

AE	$	29,974.18

LOAN Payment Calculation						
Year	Beginning Balance		Interest Payment		Principle Payment	Ending Balance
1 $	50,000.00	$	6,500.00	$	23,474.18 $	26,525.82
2 $	26,525.82	$	3,448.36	$	26,525.82 $	-

b. A depreciation table using the depreciation rate provided in the problem. [1 points]

	Depreciation Table				
n	MACRS		Dn		BVn
0				$	50,000.00
1 $	0.45	$	22,500.00	$	27,500.00
2 $	0.55	$	27,500.00	$	-

c. The capital gain / loss of the machine at the end of year 2 [3 points]

S > BV2				
Taxable gain	= S - BV	$	9,000.00	
Tax Rate = 30%				
Therefore Taxable Gain		$	2,700.00	

d. Using the information given and the calculated values in parts a, b and c, determine the after tax cash flow for the project: [3 points]
Develop the Income Statement
Develop the Cash flow Statement
Is this project justifiable at a MARR of 18%?
Calculate the NPV of the Project.
Calculate the IRR of the Project. If an error is returned in Excel, Why?

Income Statement	Year	1		2
	Revenue	$ 5,000.00	$	5,000.00
	Expenses:			
	Cash	$ 300.00	$	300.00
	Depreciation	$ 22,500.00	$	27,500.00
	Interest Payment	$ 6,500.00	$	3,448.36
	Taxable Income	$ (24,300.00)	$	(26,248.36)
	Income Tax	$ (7,290.00)	$	(7,874.51)
	Net Income	$ (17,010.00)	$	(18,373.85)

Cash Flow Statement	Year	0	1	2
	Operating Activities			
	Net Income		$ (17,010.00)	$ (18,373.85)
	Deperecitaion		$ 22,500.00	$ 27,500.00
	Investment Activities			
	Investment	$ -		
	Salvage			$ 9,000.00
	Gains Tax			$ (2,700.00)
	Working Capital	$ (13,000.00)		
	Financing Activities			
	Borrowed Funds	$ 50,000.00		
	Principle Payement		$ (23,474.18)	$ (26,525.82)
	Net Cash Flow	$ 37,000.00	$ (17,984.18)	$ (11,099.67)

PW	$	(37,000.00)	$	(15,240.83)	$	(17,378.11)
PW =	$	(69,618.94)				

The PW < 0; therefore this project is not justifiable

IRR	#NUM!

IRR shows the an error. It could either be because of the number is too small or negative value of Principle amount. OR as per microsoft help, it could be because of $ sign. But I checked for it & it wasn't the issue.