ISyE 3025, Quiz 3
Your name (PRINT):_____ Your 9-digit GT ID:_____

Honor Code Certification:
I certify that I have abided by the rules of the Georgia Tech honor code for student conduct on exams and by the specific rules on reference materials for this exam, and that I have neither given nor received assistance during this examination. I certify that I have read this statement and understand it.
Signature: _____

In this quiz, unless stated to the contrary, information given in a particular question holds for the entire quiz. This quiz is structured so that Questions 2 and 3 should be solved before Question 4.

This quiz presents questions related to the nation of Grand Fenwick. After defeating the US in war (see the movie "The Mouse that Roared" which documents the war) the nation of Grand Fenwick adopted the US dollar as its official currency and most (relevant differences are noted below) of the rules for depreciation and taxes as we learned in the course. The Yeti Corporation is located in the nation of Grand Fenwick.

1. [30] The nation of Grand Fenwick has decided that it wants to support local small businesses (income less than $100,000), discourage medium businesses, and encourage large businesses. Accordingly, it has set up the following corporate income tax structure.

Range	marginal tax rate
[$0 – $100,000]	1%
[$100,001 – $1,000,000]	60%
[$1,000,001 – no limit]	15%

   i. [10] What is the total tax, average tax rate, and marginal tax rate on the following incomes?
      a. $10,222
      b. $100,222
      c. $1,000,222
   ii. [10] For what values of income is the average tax rate 35%? Be careful, there are two values and you need to provide both.
   iii. [10] The Yeti Corporation is located in the capital city of the nation of Grand Fenwick and must therefore pay city taxes as well as national taxes. The city taxes are a flat 10% rate and are deductible from the income tax paid to the national government. Considering both city and national taxes, what are the total tax, average tax rate, and marginal tax rate on the following incomes?
      a. $10,222
      b. $100,222
      c. $1,000,222

(i)

income	total tax	average tax rate	marginal tax rate
10,222	102.22	0.01	0.01
100,000	1,000.00		
100,222	1133.2	0.0113	0.6
1,000,000	541,000		
1,000,222	541,033.3	0.541	0.15

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This page is provided in case you need additional room to answer Question 1.

(ii) $\frac{1000 + .6(x - 100{,}000)}{x} = 0.35$

$0.6x - 0.35x = 59{,}000$

$x = 236{,}000$

$\frac{541{,}000 + 0.15(x - 1{,}000{,}000)}{x} = 0.35$

$.2x = 391{,}000$

$x = 1{,}955{,}000$

(iii)

income	state tax	taxible national income	national tax	total tax	Average tax rate	Marginal tax rate
10,222	1,022.2	9199.8	92.00	1114.2	0.109	0.109
100,222	10,022.2	90,199.8	902.00	10924.2	0.109	0.109
1,000,222	100,022.2	900,199.8	481,119.88	581,142.08	0.581	0.64

2. [20] For the remainder of the quiz assume that the Yeti Corporation must pay national taxes as detailed in Question 1, but *does not* pay city taxes. Moreover, assume that the Yeti Corporation has consistently made profits well in excess of $1,000,000 and will continue to do so for the remainder of this quiz.

   The Yeti Corporation has purchased a new stomping machine for $444,444 which it has classified as a 3-year class asset. The nation of Grand Fenwick allows both MACRS with specified percentages and the Alternate MACRS (MACRS straight line method). Calculate the depreciate amounts for the first two years. In addition, calculate the tax consequence in the second year (year 2) from the depreciation
   i. [10] if the Yeti Corporation uses MACRS with specified percentages
   ii. [10] if the Yeti Corporation uses Alternate MACRS (MACRS straight line method).

Marginal tax rate = 0.15

(i)

year	Depreciation %	Depreciation	tax consequence*
1	33.33	148,113.19	
2	44.45	197,555.36	-29,633.30

(ii)

1	(1/2)(1/3)	74,074.00	
2	1/3	148,148	-22,222.2

* negative number means a tax benefit

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3. [20] The Yeti Corporation is considering taking out a bank loan to help finance the purchase of the stomping machine. Assume that
   - The loan will be for $400,000.
   - The bank will charge 5% interest and payments to the bank will be made once per year.
   - The loan will be for 4 years

   For the first two years of this loan detail all associated cash flows if the Yeti Corporation repays the loan in

   i. [10] equal yearly payments?
   ii. [10] equal yearly principal payments?

   Do not forget to include tax consequences. Use the tax information given in Questions 1 and 2.

(i) yearly payments are $400{,}000[A/P,5\%,4] = 400{,}000(0.28201)$
$= 112804$

Year	balance Start	total pay	principal pay	interest pay	tax consequence*
1	400,000	112,804	92,804	20,000	-3000
2	307,196	112,804	97,444.2	15,359.8	-2303.97

(ii)

1	400,000	120,000	100,000	20,000	-3000
2	300,000	115,000	100,000	15,000	-2250

* negative number means a tax benefit.

4. [30] The Yeti Corporation has decided to go ahead with the project under the following conditions
   - It will use MACRS with specified percentages depreciation as described in Question 2(i)
   - I will take out a loan with equal yearly payments as described in Question 3(i)
   - It will terminate the project at the end of year 2 at which time it will
     - Payback the remaining balance of the loan
     - Sell the stomping machine
   - The project will bring in additional revenues of $100,000 per year and have additional operating costs of $9,000 per year. Additional revenues and operating costs terminate at the end of the project.
   - The capital gains tax (if indeed there are capital gains) in the nation of Grand Fenwick is 10%.

   i. [20] Calculate all the yearly after tax cash flows (ATCFs) associated with this investment as well as the NPV (net present value) of the investment using a discount rate of 15% if the stomping machine is sold for $1,000? So that there is no misunderstandings, *circle* all yearly ATCFs as well as the NPV.

   ii. [10] How would your answer to part (i) change if the stomping machine is sold for $500,000?

Note that depreciation in year 2 is only ½ of what was calculated in question 2 (because the asset is sold in year 2). That is 197555.36/2 = 98777.68

Book value at time of Sale 444,444
− 148,113.19
− 98777.68
197,553.13

(i)

Year	operating cash	Dep	loan princ 400,000	loan int	M/C purchase/sale −444,444	TI	tax	ATCF
(0)								−44,000
1	91,000	148113.19	92804	20,000		−77113.19	−1156.98	+102,37.02
2	91,000	98777.68	9744.20	15,359.8		−23137.48	−3470.62	−18333.38
2′		209751.8						−209751.8
2″					1000	−196553.13	−29782.79	30,782.79

loss on sale = BV − Sale price

$$NPV = -44444 - 10,237.02/(1.15) - 18333.34/(1.15)^2 - 209751.8/(1.15)^2 + 30782.79/(1.15)^2 = -225810.92 + 30782.79/1.15^2$$

$$= -202,534.71$$

ii) 2″ would be replaced by

BV →	197553.13	0	0	197553.13
→	24689.87	24689.87	3703.63	20985.724
→	55,556	55556	5555.6	50000.4

columns as in part (i)

depreciation recapture

capital gains

$$NPV = -225810.92 + (197553.13 + 20985.724 + 50000.4)/1.15^2$$

$$= 120,057$$