Name: S0lm s

Directions:
This exam has 8 pages, including this page. Please make sure you have all 8 pages.

You have 75 minutes to complete this exam.

Please answer the following questions and make sure your answer are legible. If you don’t show work and/or I can’t follow it, I won’t give partial credit. You may use a calculator (not the calculator function on other technology) and the Formula Sheet(s) that I provide you, nothing else (no smart watches, no earbuds, etc). Good Luck.

This test has 103 points.

<table>
<thead>
<tr>
<th>Page</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
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<td>9</td>
<td>16</td>
<td>11</td>
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<td>103</td>
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</table>

Short Answer: This section is short answer. You should be able to answer these questions with (almost) no work. You don’t need to show work for these questions.

1. (1 point) Explain when it’s advisable to put money in a Roth IRA, rather than a traditional IRA.

   When you expect your tax rate (tax bracket) to be higher later than it is now.

2. (1 point) Explain what we mean by ‘in today’s dollars’

   Same buying power as today.

3. (2 points) Circle the best answer. You should be able to answer these without out doing any calculations.

   William took out a car loan for $15,000, and will repay it over 3 years at 4% interest.
   Walter took out a car loan for $15,000, and will repay it over 5 years at 4% interest.

   (a) Who will pay more in interest, William or Walter?
   (b) Who will have higher monthly payments, William or Walter?

4. (5 points) Indicate if the following are true or false. Ambiguous answers will be marked as wrong.

   (a) True/False: With a DC retirement plan, if you leave your job early, you will lose your contributions to your retirement account if you’re not vested.

   (b) True/False: Contributions to a Roth IRA are tax deductible today.

   (c) True/False: Money from a 401(k) is taxed when it is withdrawn.

   (d) True/False: If you are a college student, and your parents claim you as an exemption on their taxes, it’s fine (legal) if you also claim yourself as an exemption on your taxes.

   (e) True/False: The remaining balance of a loan is the total amount of money you will spend repaying the loan (assuming you make all payments as scheduled).
5. (2 points) Circle the best answer. Elizabeth is in the 25% tax bracket.
   (a) Elizabeth will pay Less than 25% / Exactly 25% / More than 25% of her taxable income in federal income taxes.
   (b) Elizabeth will pay Less than 25% / Exactly 25% / More than 25% of her gross income in federal income taxes.

6. (1 point) Which of the following best classifies the following question?
   You do NOT need to answer this question, just circle the best answer below.
   Captain Broyles is determining what his goal amount for retirement should be. He knows he needs enough money to make equal payments of $2750 to himself every month for 30 years out of the large sum of money he hopes will be in his retirement account. He assumes the account will earn a real rate of return of 4.99%, how much does Captain Broyles need in his retirement account on the day he retires?
   - Future value ordinary annuity
   - Present value ordinary annuity
   - Future value annuity due
   - Present value annuity due

7. (1 point) Which of the following is the appropriate formula to answer the question below?
   You do NOT need to answer this question, just circle the best answer below.
   Nina Sharp just adopted a child, and decides to save money for her daughter’s college. She opens the account and immediately deposits $25, and plans to do the same every week for the next 9 years. Nina assumes the account will earn 6.25%, how much money will be in the account when her daughter is ready for college?
   - \( FV = PMT s_{n|i} \)
   - \( FV = PMT s_{n|i}(1 + i) \)
   - \( PV = PMT a_{n|i} \)
   - \( PV = PMT a_{n|i}(1 + i) \)

8. (5 points) Fill in the blanks with the appropriate vocabulary word
   (a) Defined Benefit retirement program that provides a set income in retirement.
   (b) Annuity any collection of equal payments made at regular time intervals.
   (c) F.V. annuity factor the future value that would accumulate if each annuity payment was $1.
   (d) Inflation the tendency of prices to rise over time.
   (e) Exemption an amount of nontaxable income for each person who can be claimed as a dependent.

\( FV \) could also be answered as \( s_{n|i} \)
9. (11 points) Lincoln Lee is at a car dealership. He has saved up $3,000 to use as a down payment, and because of his salary as an FBI Agent, he determines he can afford to pay $720 a month in car payments. If he qualifies for 3.85% interest and plans to take out a 4 year loan, making monthly payments.

(a) What is the most expensive car he can buy?

(b) Bonus (1 pt) How much will Lincoln spend repaying this loan? (assume he buys the most expensive car he can afford)

\[ PV = PMT \times \frac{1}{1 - (1 + i)^{-n}} \]

\[ PV = 31,982.95 \]

\[ PMT = 720 \]

\[ i = 0.0385/12 \]

\[ n = 4 \times 12 = 48 \]

\[ a_{\overline{48}|} = \frac{(1 + 0.0385/12)^{48} - 1}{(1 + 0.0385/12)^{48}} = 44.42076558 \]

\[ a_{\overline{48}|} = \frac{1}{(1 + 0.0385/12)^{48}} \]

(a) Lincoln can buy a $31,982.95 car

(b) He'll repay $34,560 (for his $31k loan)

10. David Robert Jones needs $38,700 saved up for an evil plan he intends to execute in 8 years. He plans on making quarterly deposits into an account that earns 4.75% with the intent to have $38,700 saved by the end of 8 years. His first deposit is the day he opens the account.

(a) (10 points) How much should each quarterly deposit be?

(b) (1 point) How much will David Robert Jones earn in interest?

\[ FV = PMT \times s_{\overline{n}|} (1 + i) \]

\[ FV = 38,700 \]

\[ PMT = ? \]

\[ n = 8 \times 4 = 32 \]

\[ i = 0.0475/4 \]

\[ s_{\overline{32}|} = \frac{(1 + 0.0475/4)^{32} - 1}{0.0475/4} = 38.65384293 \]

\[ 38,700 = PMT + 38,653.84 (1 + 0.0475/4) \]

\[ 989.44 = PMT \]

\[ 31700 - 32 \times 989.44 = 7037.92 \]

1 The evil plan involves acquiring a large amount of Amphilicite to generate the energy to eradicate two universes.
11. (14 points)

(a) Massive Dynamic took out a small business loan, they have 17 quarterly payments of $5,638.14 remaining, and the interest rate on the loan is 5.7%. What is the remaining balance on their loan?

(b) Interest rates have come down, Massive Dynamic now qualifies for a 5 year loan at 5.15% interest. Assuming they refinance their small business loan, what will their quarterly payments be?

(c) Bonus (2pts): Determine if how much money they will save (or how much more money they will spend) by refinancing.

\[
\text{Rem Bal} = PV \text{ of all remaining PMTs}
\]

\[
PV = PMT \times a_{n|i}
\]

\[
PV = ?
\]

\[
PMT = 5638.14
\]

\[
n = 17
\]

\[
i = .057/4
\]

\[
a_{n|i} = \frac{(1 + .057/4)^{17} - 1}{(.057/4)}
\]

\[
= 15.00329508
\]

---

**Old Loan**

**New Loan**

b) Annuity, PV, ord (by default)

\[
PV = PMT \times a_{n|i}
\]

\[
PV = 584,590.61
\]

\[
PMT = ?
\]

\[
n = 5.4 \times 20
\]

\[
i = .0515/4
\]

\[
a_{n|i} = \frac{(1 + .0515/4)^{20} - 1}{(.0515/4)}
\]

\[
= 17.53373859
\]

---

**Bonus**

Total Spent (Old Loan)

\[
17 \times 5638.14 = 95,848.31
\]

V.S.

Total Spent (New Loan)

\[
20 \times 4824.45 = 96,489
\]

*They will spend $640.62 more with refinancing. (since they are spreading the payments out over more time)*
12. (4 points) Rachel Dunham works at a company that offers a 40% on contributions to her retirement account up to 5% of salary. Rachel makes $47,000 a year. How much will be added to Rachel’s retirement account this year if she contributes 6% of her salary?

\[ \text{Contrib:} \quad \frac{6\% \times \text{salary}}{40\%} = \frac{8\% \text{ of yearly sal}}{0.06 \times 47,000 = \$3,760 \quad \text{will go into ret. act.} \]

13. (5 points) Astrid has been working at her job for 4 years and 10 months. Astrid’s contributions to her retirement account have accumulated to $12,348, and her retirement account currently is currently worth a total of $16,464. If her company uses the vesting schedule below, how much of her balance will Astrid get to keep if she leaves her job today?

<table>
<thead>
<tr>
<th>Years of Service Completed</th>
<th>Vesting Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 years</td>
<td>0%</td>
</tr>
<tr>
<td>1 – 2 years</td>
<td>20%</td>
</tr>
<tr>
<td>2 – 3 years</td>
<td>40%</td>
</tr>
<tr>
<td>3 – 4 years</td>
<td>60%</td>
</tr>
<tr>
<td>4 – 5 years</td>
<td>80%</td>
</tr>
<tr>
<td>5+ years</td>
<td>100%</td>
</tr>
</tbody>
</table>

Astrid is 80% vested

\[ \text{Astrid keep} = \frac{12,348}{\text{Her Contrib}} + \frac{0.80 \times 4116}{80\% \text{ comp contrib}} = 15,640.80 \]

\[ \text{Astrid: } 912,348 \quad \text{comp: } 16,464 \quad -12,348 \quad \frac{-12,348}{4116} \]

\[ \text{Astrid keep} = \frac{12,348}{\text{Her Contrib}} + \frac{0.80 \times 4116}{80\% \text{ comp contrib}} = 15,640.80 \]
14. (6 points) Charlie is planning for his retirement, and determines that he will need $750,000 in his retirement account when he retires in 42 years. He assumes his 401(k) will earn 6.5%, and his friend (whose taking Math 34) calculated that monthly payments of $285.68 into the 401(k) will accomplish this goal.

If Charlie makes $60,000 per year working at a company that matches his contributions to his 401(k) at 70% up to 4% of salary. How much does Charlie need to contribute to his 401(k) to meet his goal? Make sure you show all work for this question.

\[ \text{Multiplier: } 100\% + 70\% = 170\% \]  
\[ (1.70) \text{ Chnly contrib = PMT} \]
\[ 1.70 \times \text{C.C.} = 285.68 \]
\[ \text{C.C.} = \frac{285.68}{1.70} = 168.05 \]

Check it over May
\[ \text{monthly sal} = \frac{60,000}{12} = 5000 \text{ per month} \]
\[ 4\% \times 5000 = 200 \]

\[ \text{so } 168.05 \text{ is under max} \]

Charlie contrib = $168.05

15. (10 points) John Scott is planning for his retirement. He assumes his retirement account will earn an average of 8.3%, and he assumes that inflation will average 3%. John’s late to start planning for his retirement, he plans to retire in 27 years, and assumes he’ll need a minimum of $450,000 to retire. And of course, that’s $450,000 in today’s dollars. Assuming John plans for his monthly payments to keep pace with inflation, what do John’s monthly payments need to be too meet his goal? (Answer in today’s dollars).

\[ FV = PMT \times s_{\text{mi}} \]
\[ FV = 450,000 \]
\[ PMT = ? \]
\[ n = 27 \times 12 = 324 \]
\[ i = .053/12 \]
\[ s_{\text{mi}} = \frac{(1 + .053/12)^{324} - 1}{.053/12} = 177.67 \text{ (in today) $7) } \]

John’s monthly PMT is $627.03
16. (4 points) Nina is looking at a car that costs $23,000, if inflation averages 2.75% over the next 3 years, what will the car cost in 2019 (in 3 years)?

\[ FV = PV \left(1 + \frac{i}{n}\right)^n \]

\[ FV = 23000 \left(1 + 0.0275\right)^3 \]

\[ FV = \frac{25,685.74}{y_{000}} \text{estimated price of car in 3 years} \]

17. (7 points) The general sales tax rate in Massachusetts is 6.25%, but prepared foods are taxed at 7%.

One day Walter sends his assistant out for the following items:

- Milkshake (prepared)  $4.50 \rightarrow 7\%$
- Licorice candy $7.00 \}$ 6.25\%
- Root Beer $1.99$

What will the total bill be?

\[ T = P(1 + r) \]

\[ T = 4.50(1 + 0.07) \]

\[ T = 4.82 \]

\[ T = 9.55 \]

\[ \text{Total Bill} = 4.82 + 9.55 = \boxed{\$14.37} \]
18. Olivia and Peter are married with one dependent child (Henrietta). In 2015 they had a combined gross income of $124,800. They paid $6174 in state and local taxes, they contributed $4280 to a 401(k) retirement plan, they donated $500 to charity, and they had $3141 in tax deductible medical expenses.

(a) (1 point) How many exemptions will Olivia and Peter claim on their taxes?

3 (Olivia, Peter, & Etta)

(b) (4 points) What is their taxable income?

\[
\text{Exemptions: } 3 + 4000 = 4000
\]

\[
\text{Itemized Ded: } 6174 + 4280 + 500 + 3141 = 14,095
\]

\[
\text{Std. Ded: } 12,600
\]

\[
\text{Taxable Income} = 124,800 - 12,000 - 14,095 = 98,705
\]

(c) (1 point) What tax bracket are Olivia and Peter in?

25% (married)

(d) (3 points) What is Olivia and Peter's Federal Income Tax for 2015?

\[
\text{Excess} = 98,705 - 74,900 = 23,805
\]

\[
\text{Income Tax} = 10,312.50 + .25(23,805) = 16,263.75
\]

(e) (4 points) If Olivia had $10,850.29 total withheld from her paychecks in 2015, and Peter had $326.43 withheld from each of his biweekly paychecks...

i. Do they owe money in taxes or do they get a refund?

ii. What is the amount they owe or the amount of their refund?

\[
\text{Olivia Withholdings: } 10,850.29 + 26 + 326.43 = 19,337.47
\]

\[
\text{Fed Inc Tax: } 16,263.75
\]

\[
\text{i. Refund: } 19,337.47 - 16,263.75 = 3,073.72
\]

\[
\text{ii. Refund: } 3,073.72
\]
Math 34: 2015 Income Tax Info

- The exemption amount is $4,000 (per person)
- Standard Deduction: $6,300 for a single taxpayer and $12,600 for married filing jointly
- 2015 Tax Rates for 'Single' Filing

<table>
<thead>
<tr>
<th>If Taxable Income is:</th>
<th>The Tax Is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not over $9,225</td>
<td>10% of the taxable income</td>
</tr>
<tr>
<td>Over $9,225 but not over $37,450</td>
<td>$922.50 plus 15% of the excess over $922.50</td>
</tr>
<tr>
<td>Over $37,450 but not over $90,750</td>
<td>$5,156.25 plus 25% of the excess over $37,450</td>
</tr>
<tr>
<td>Over $90,750 but not over $189,300</td>
<td>$18,481.25 plus 25% of the excess over $90,750</td>
</tr>
<tr>
<td>Over $189,300 but not over $411,500</td>
<td>$46,075.25 plus 33% of the excess over $189,300</td>
</tr>
<tr>
<td>Over $411,500 but not over $413,200</td>
<td>$119,401.25 plus 35% of the excess over $411,500</td>
</tr>
<tr>
<td>Over $443,200</td>
<td>$119,996.25 plus 39.6% of the excess over $443,200</td>
</tr>
</tbody>
</table>

- 2015 Tax Rates for 'Married Filing Jointly'

<table>
<thead>
<tr>
<th>If Taxable Income is:</th>
<th>The Tax Is:</th>
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</thead>
<tbody>
<tr>
<td>Not over $18,450</td>
<td>10% of the taxable income</td>
</tr>
<tr>
<td>Over $18,450 but not over $74,900</td>
<td>$1,345 plus 15% of the excess over $18,450</td>
</tr>
<tr>
<td>Over $74,900 but not over $151,200</td>
<td>$10,312.50 plus 25% of the excess over $74,900</td>
</tr>
<tr>
<td>Over $151,200 but not over $239,450</td>
<td>$29,387.50 plus 28% of the excess over $151,200</td>
</tr>
<tr>
<td>Over $239,450 but not over $411,500</td>
<td>$51,577.50 plus 33% of the excess over $239,450</td>
</tr>
<tr>
<td>Over $411,500 but not over $464,850</td>
<td>$111,324.00 plus 35% of the excess over $411,500</td>
</tr>
<tr>
<td>Over $464,850</td>
<td>$129,996.50 plus 39.6% of the excess over $464,850</td>
</tr>
</tbody>
</table>

- 2015 Withholding for BIWEEKLY paid Single Filer

<table>
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<tr>
<th>Amount of wages withholding after subtracting allowances but not over</th>
<th>Amount of income over which tax to withhold is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over $0</td>
<td>$0</td>
</tr>
<tr>
<td>$88</td>
<td>$0.00 plus 10% of excess over $88</td>
</tr>
<tr>
<td>$443</td>
<td>$35.50 plus 15% of excess over $443</td>
</tr>
<tr>
<td>$1,5296</td>
<td>$198.40 plus 25% of excess over $1,529</td>
</tr>
<tr>
<td>$3,579</td>
<td>$710.90 plus 28% of excess over $3,579</td>
</tr>
<tr>
<td>$7,369</td>
<td>$1,772.10 plus 33% of excess over $7,369</td>
</tr>
<tr>
<td>$15,915</td>
<td>$4,592.28 plus 35% of excess over $15,915</td>
</tr>
<tr>
<td>$15,981</td>
<td>$4,615.38 plus 39.6% of excess over $15,981</td>
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</table>

- 2015 Withholding for BIWEEKLY paid Married Filing Jointly

<table>
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<tr>
<th>Amount of wages withholding after subtracting allowances but not over</th>
<th>Amount of income over which tax to withhold is:</th>
</tr>
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<tbody>
<tr>
<td>Over $0</td>
<td>$0</td>
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<td>$0.00 plus 10% of excess over $331</td>
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<td>$1,040</td>
<td>$709.00 plus 15% of excess over $1,040</td>
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<td>$396.70 plus 25% of excess over $3,212</td>
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<td>$6,146</td>
<td>$1,130.20 plus 28% of excess over $6,146</td>
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<tr>
<td>$9,194</td>
<td>$1,983.64 plus 33% of excess over $9,194</td>
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<td>$16,158</td>
<td>$4,281.76 plus 35% of excess over $16,158</td>
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<tr>
<td>$18,210</td>
<td>$4,999.96 plus 39.6% of excess over $18,210</td>
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