Module gtf1

Simple Versus Compound Interest

What is the difference between simple and compound interest and does it really matter?

There are various methods for computing interest. Do you know what the disparity is between them over time?

Quantitative concepts and skills
Simple Interest (Arithmetic Growth)
Compound Interest (Geometric Growth)
Graphing

PREVIEW

Simple interest is an example of arithmetic growth where the amount of interest generated each term is constant, based on only the starting amount. ***Compound interest*** is an example of geometric, or exponential, growth where the amount of interest generated each term increases because it is based on both the starting amount and previously earned interest.

Slides 3 & 4 have you setting up your worksheet and formatting your cells

Slides 5-9 have you computing simple and compound interest for a set period of time and interest rate, and then graphing the results. Slides 5 & 6 go through the simple interest calculation. Slides 6 & 7 go through the compound interest calculation. Slide 7 asks you to graph the results and slide 8 asks you to add trend lines to the graph. For Slides 5 & 6, you need to embed the interest calculations within the cell equations of your spreadsheet.

Slides 10-12 ask you to calculate difference using other interest rates.

Slides 13 & 14 give the assignment to hand in.

Question #1: What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at 8% for 25 years?

	B	C	D	E	F	G
2	Present Value =	100000		Year	Simple	Compound
3	Interest Rate =	8%		1		
4				2		
5				3		
6				4		
				5		
				6		
				7		
				8		
				9		
				10		
13				11		
14				12		
15				13		
16				14		
17				15		
18				16		
19				17		
20				18		
21				19		
22				20		
23				21		
24				22		
25				23		
26				24		
27				25		

Type in the "%" symbol when entering percents; otherwise you must enter the decimal form.

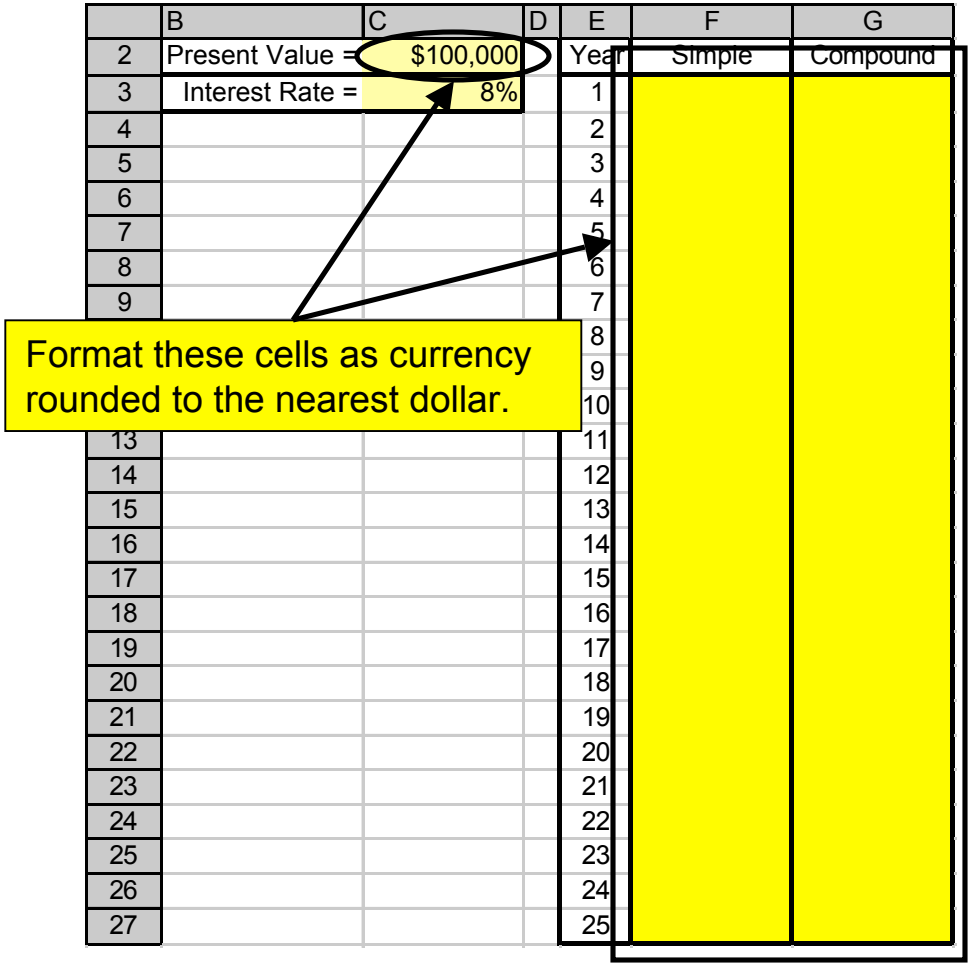
One way to answer the question with a spreadsheet is to lay it out year by year.

Recreate this spreadsheet

= Cell with a number in it.

= Cell with an equation in it.

(Q #1) What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at 8% for 25 years?



To format cells:

1. Select the cells
2. Right click the mouse
3. Select “Format Cells”
4. Choose “Number” tab
5. Choose “Currency”
6. Adjust “Decimal Places” to the desired place value
7. Select “OK”

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9				7		
10				8		
11				9		
12				10		
13				11		
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20				18		
21				19		
22				20		
23				21		
24				22		
25				23		
26				24		
27				25		

Compute the results for each year in the simple interest column.

The Simple Interest Formula:

$$FV = PV(1 + rt)$$

Where
FV = Future Value ($)
PV = Present Value ($)
r = Interest Rate
t = Time (Years)

(Q #1) What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at 8% for 25 years?

	B	C	D	E	F	G
2	Present Value =	$100,000		Year	Simple	Compound
3	Interest Rate =	8%		1	$108,000	
4				2	$116,000	
5				3	$124,000	
6				4	$132,000	
7				5	$140,000	
8				6	$148,000	
9				7	$156,000	
10				8	$164,000	
11				9	$172,000	
12				10	$180,000	
13				11	$188,000	
14				12	$196,000	
15				13	$204,000	
16				14	$212,000	
17				15	$220,000	
18				16	$228,000	
19				17	$236,000	
20				18	$244,000	
21				19	$252,000	
22				20	$260,000	
23				21	$268,000	
24				22	$276,000	
25				23	$284,000	
26				24	$292,000	
27				25	$300,000	

Compute the results for each year in the compound interest column.

The Compound Interest Formula:

$$FV = PV(1 + r)^t$$

Where
FV = Future Value ($)
PV = Present Value ($)
r = Interest Rate
t = Time (Years)

(Q #1) What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at 8% for 25 years?

	B	C	D	E	F	G
2	Present Value =	$100,000		Year	Simple	Compound
3	Interest Rate =	8%		1	$108,000	$108,000
4				2	$116,000	$116,640
5				3	$124,000	$125,971
6				4	$132,000	$136,049
7				5	$140,000	$146,933
8				6	$148,000	$158,687
9				7	$156,000	$171,382
10				8	$164,000	$185,093
11				9	$172,000	$199,900
12				10	$180,000	$215,892
13				11	$188,000	$233,164
14				12	$196,000	$251,817
15				13	$204,000	$271,962
16				14	$212,000	$293,719
17				15	$220,000	$317,217
18				16	$228,000	$342,594
19				17	$236,000	$370,002
20				18	$244,000	$399,602
21				19	$252,000	$431,570
22				20	$260,000	$466,096
23				21	$268,000	$503,383
24				22	$276,000	$543,654
25				23	$284,000	$587,146
26				24	$292,000	$634,118
27				25	$300,000	$684,848

Now create a single scatter graph where simple and compound interest are on the y-axis and time is on the x-axis.

To draw a graph, you may either click on the chart wizard button

or use “Insert → Chart” from the menu.

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3	Interest Rate =	8%		1	$108,000	$108,000
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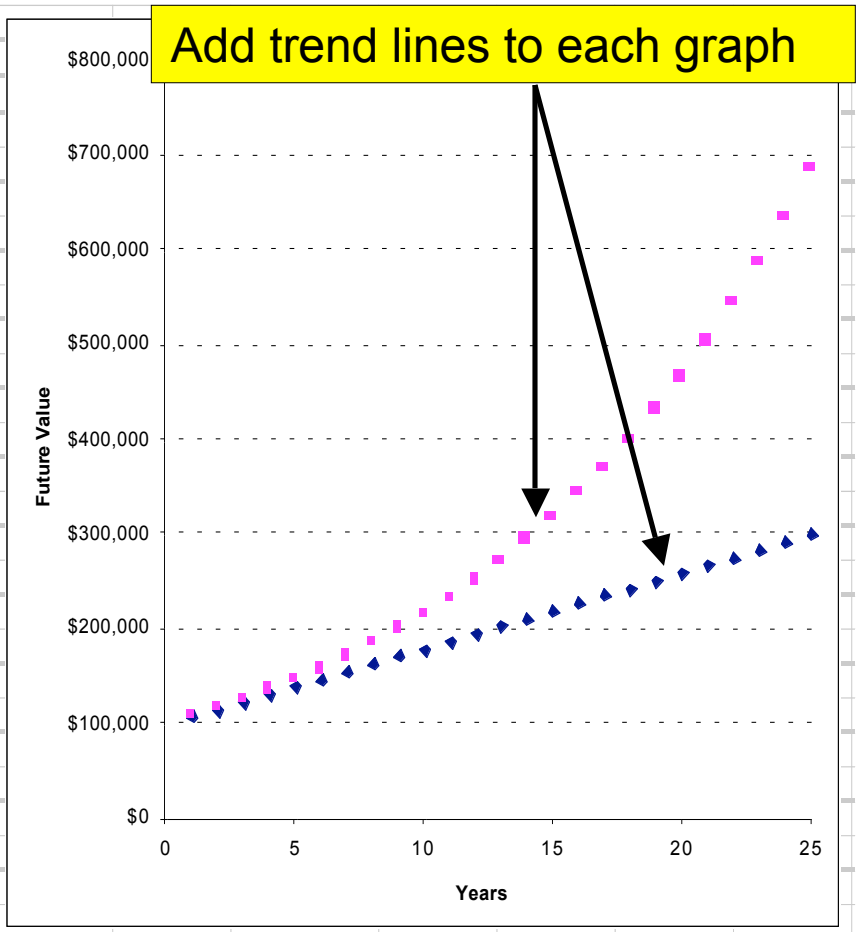
5				3	$124,000	$125,971
6				4	$132,000	$136,049
7				5	$140,000	$146,933
8				6	$148,000	$158,687
9				7	$156,000	$171,382
10				8	$164,000	$185,093
11				9	$172,000	$199,900
12				10	$180,000	$215,892
13				11	$188,000	$233,164
14				12	$196,000	$251,817
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27				25	$300,000	$684,848

To add a trend line:

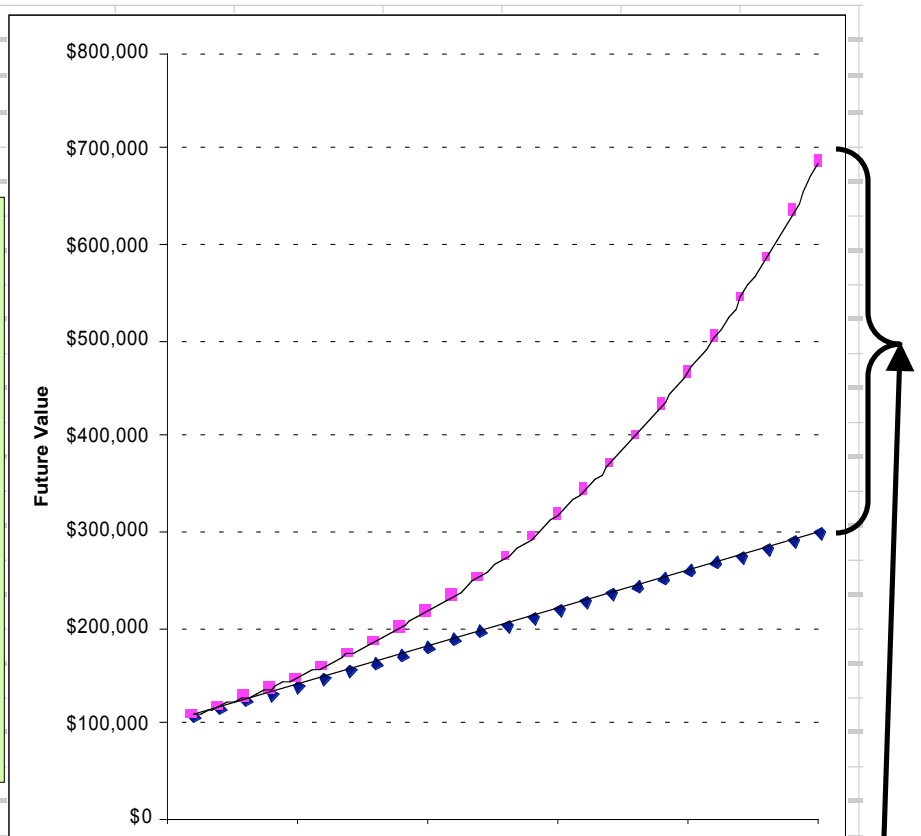
1. Place mouse over any data point of the desired function
2. Right-click the mouse
3. Select “Add Trendline”
4. Choose the type that resembles the pattern



(Q #1) What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at 8% for 25 years?

	B	C	D	E	F	G
2	Present Value =	$100,000		Year	Simple	Compound
3	Interest Rate =	8%		1	$108,000	$108,000
4				2	$116,000	$116,640
5				3	$124,000	$125,971
6				4	$132,000	$136,049
24				22	$276,000	$543,654
25				23	$284,000	$587,146
26				24	$292,000	$634,118
27				25	$300,000	$684,848

When presenting information in written documents, tables and graphs are used to present information that would be too wordy or repetitive in sentence form. "Tables are often preferred for the presentation of quantitative data … because they provide exact information; (graphs) typically require the reader to estimate values. On the other hand, (graphs) convey at a quick glance an overall pattern of results" (APA, 2001).

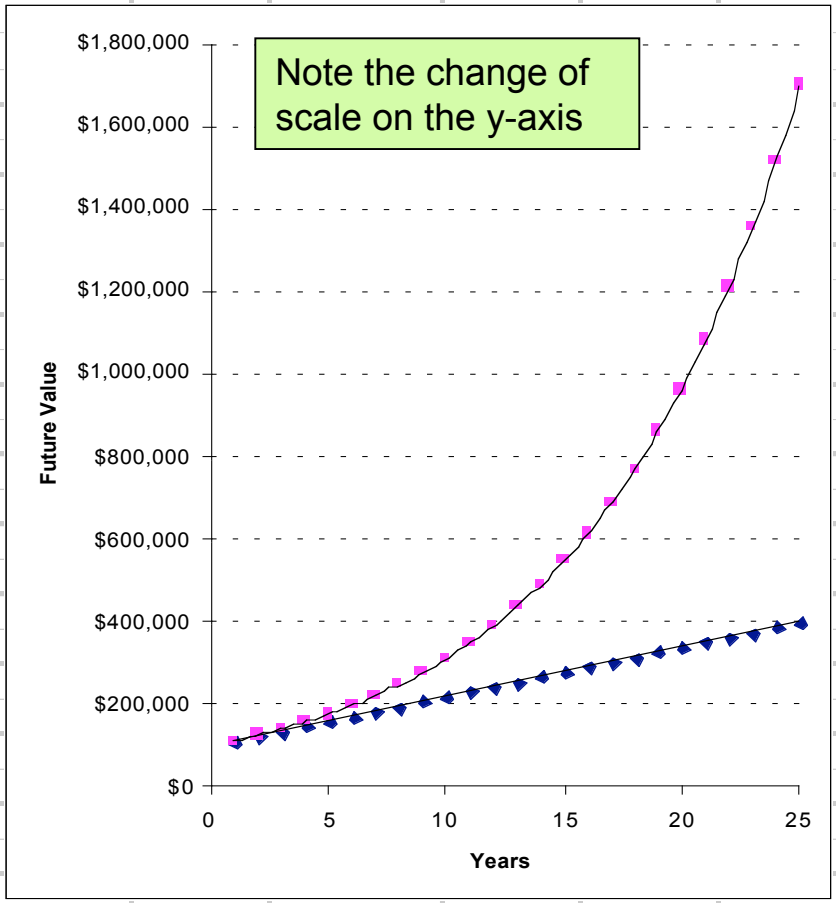


The difference between them is almost $400,000.

The difference between them is exactly $384,848.

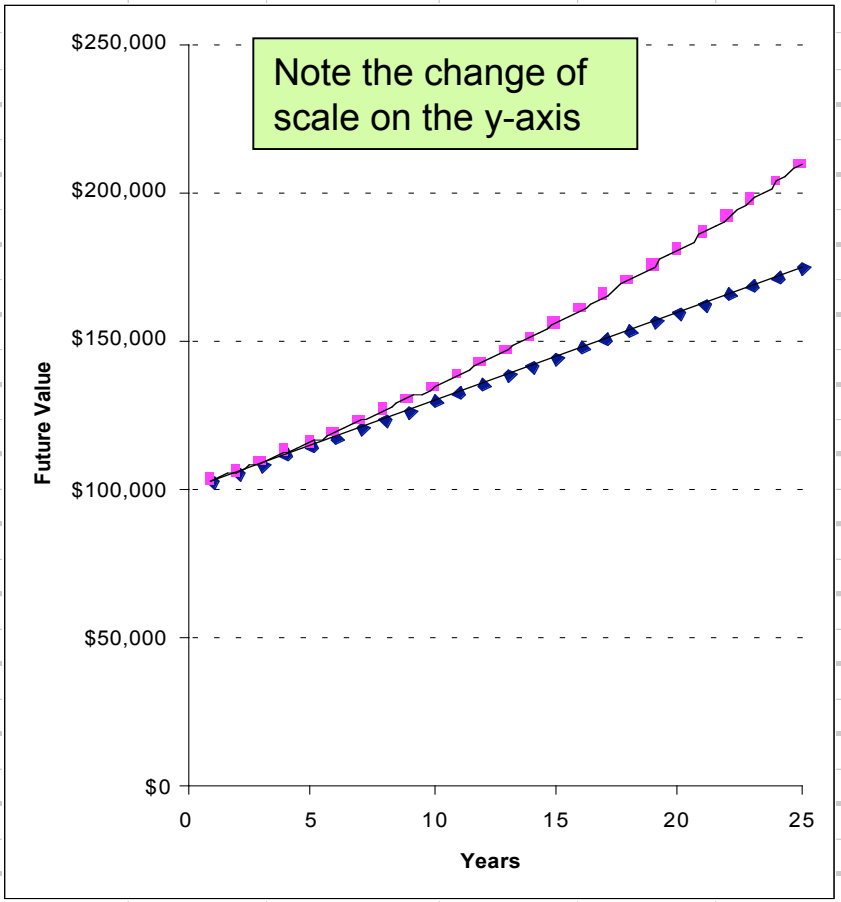
Question #2: What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at **12%** for 25 years?

	B	C	D	E	F	G
2	Present Value =	100000		Year	Simple	Compound
3	Interest Rate =	12%		1	$112,000	$112,000
4				2	$124,000	$125,440
5				3	$136,000	$140,493
6				4	$148,000	$157,352
7				5	$160,000	$176,234
8				6	$172,000	$197,382
9				7	$184,000	$221,068
10				8	$196,000	$247,596
11				9	$208,000	$277,308
12				10	$220,000	$310,585
13				11	$232,000	$347,855
14				12	$244,000	$389,598
15				13	$256,000	$436,349
16				14	$268,000	$488,711
17				15	$280,000	$547,357
18				16	$292,000	$613,039
19				17	$304,000	$686,604
20				18	$316,000	$768,997
21				19	$328,000	$861,276
22				20	$340,000	$964,629
23				21	$352,000	$1,080,385
24				22	$364,000	$1,210,031
25				23	$376,000	$1,355,235
26				24	$388,000	$1,517,863
27				25	$400,000	$1,700,006



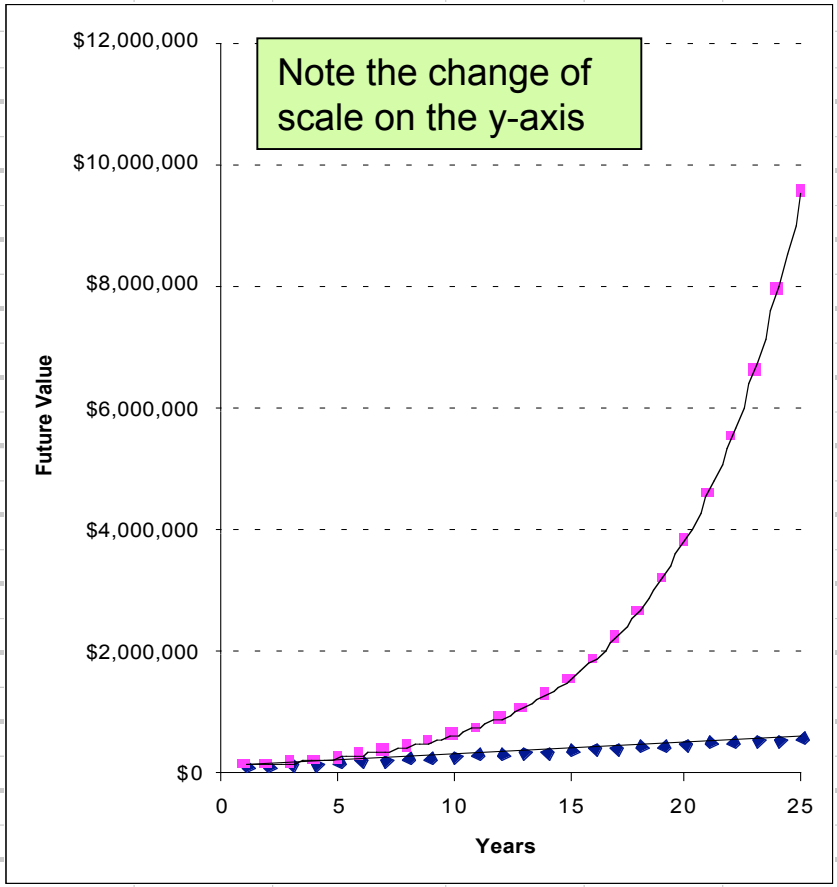
Question #3: What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at **3%** for 25 years?

	B	C	D	E	F	G
2	Present Value =	100000		Year	Simple	Compound
3	Interest Rate =	3%		1	$103,000	$103,000
4				2	$106,000	$106,090
5				3	$109,000	$109,273
6				4	$112,000	$112,551
7				5	$115,000	$115,927
8				6	$118,000	$119,405
9				7	$121,000	$122,987
10				8	$124,000	$126,677
11				9	$127,000	$130,477
12				10	$130,000	$134,392
13				11	$133,000	$138,423
14				12	$136,000	$142,576
15				13	$139,000	$146,853
16				14	$142,000	$151,259
17				15	$145,000	$155,797
18				16	$148,000	$160,471
19				17	$151,000	$165,285
20				18	$154,000	$170,243
21				19	$157,000	$175,351
22				20	$160,000	$180,611
23				21	$163,000	$186,029
24				22	$166,000	$191,610
25				23	$169,000	$197,359
26				24	$172,000	$203,279
27				25	$175,000	$209,378



Question #4: What is the difference in results between savings accounts that use simple and compound interest when you invest $100,000 at **20%** for 25 years?

	B	C	D	E	F	G
2	Present Value =	100000		Year	Simple	Compound
3	Interest Rate =	20%		1	$120,000	$120,000
4				2	$140,000	$144,000
5				3	$160,000	$172,800
6				4	$180,000	$207,360
7				5	$200,000	$248,832
8				6	$220,000	$298,598
9				7	$240,000	$358,318
10				8	$260,000	$429,982
11				9	$280,000	$515,978
12				10	$300,000	$619,174
13				11	$320,000	$743,008
14				12	$340,000	$891,610
15				13	$360,000	$1,069,932
16				14	$380,000	$1,283,918
17				15	$400,000	$1,540,702
18				16	$420,000	$1,848,843
19				17	$440,000	$2,218,611
20				18	$460,000	$2,662,333
21				19	$480,000	$3,194,800
22				20	$500,000	$3,833,760
23				21	$520,000	$4,600,512
24				22	$540,000	$5,520,614
25				23	$560,000	$6,624,737
26				24	$580,000	$7,949,685
27				25	$600,000	$9,539,622



End of Module Assignment

1. **E-mail the Excel spreadsheet you created to your instructor.**

2. **Expand the number of years on your spreadsheet to 50 and redo the graph to include these new values. Does the compound interest graph for an interest rate of 3% still look linear? (Refer to Slide 11 for comparison)**

3. **How long does it take for $10,000 to double at 5% using simple interest?**

4. **How long does it take for $10,000 to double at 5% using compound interest? (round answer to nearest year)**

5. **Redo questions #3 and #4 using interest rates of 10%, 15%, and 20%?**

6. **Redo questions #3 through #5 using $2585. Did it make a difference in the amount of time for each to double, and if so, longer or shorter?**

End of Module Assignment

7. **Compute the future value using simple interest if you deposit $5,000 for 20 years at 12%.**

8. **Compute the future value using compound interest if you deposit $5,000 for 20 years at 6.5%.**

9. **How do the results from questions #7 and #8 compare?**

10. **Determine whether the following use simple or compound interest: Savings Accounts, Certificates of Deposit (CDs), New Car Loans, Credit Cards, and Mortgages.**

11. **Based on your answer to question #10, which interest method was used most and why do you think that is the case?**