Part I

This portion of the test consists of a series of questions based on the values that you will find in the solutions of the two Sudoku puzzles given. The first is a standard 9x9 Sudoku puzzle and the second is a larger 16x16 puzzle. The rules for both puzzles are the same; each row, column, and 3x3 or 4x4 square, respectively, must have the value 1-9 or 1-16, respectively, without repeating. The first puzzle is the easiest, but has the more difficult corresponding problems. The puzzles increase in difficulty while the problems associated with them decrease in difficulty. Any time you see an ordered pair**,** it denotes a value from that position on the specified puzzle. The bottom left box of every puzzle is **(1,1)**, and the first coordinate in an ordered pair represents the column number from the left of the puzzle while the second coordinate in an ordered pair represents the row number from the bottom of the puzzle (think of this just like coordinates in the first coordinate of the coordinate plane).

Puzzle 1 (Hard)

			9	3	8	5		
	1				5			
5				1			3	4
							2	5
		7		2		6		
6	8							
3	7			9				8
			3				6	
		9	1	6	7			

Puzzle 1 (Hard)

			9	3	8	5		
	1				5			
5				1			3	4
							2	5
		7		2		6		
6	8							
3	7			9				8
			3				6	
		9	1	6	7			

Puzzle 2 (Have Fun.)

	3				5				14	1	12				
7		16		10											14
10		2		15			16	5							
													5	15	1
		14		5				9			1	10			6
9		8		14	16					11	10				
	2		4			11				7		15			
			11	7		4	3					14	2	16	8
14	6	9	10		11	3		4	13		2	1			
8		12				14		1			5		3		
	1	4		16		13	8	15	10						
3		5	13						9	6			8		
	4	13	9									16			
5			8		2			6			9				12
12			3	9	14			16	1					2	
2		6				10	1	13	11			5		8	7

Puzzle 2 (Have Fun.)

	3				5				14	1	12				
7		16		10											14
10		2		15			16	5							
													5	15	1
		14		5				9			1	10			6
9		8		14	16					11	10				
	2		4			11				7		15			
			11	7		4	3					14	2	16	8
14	6	9	10		11	3		4	13		2	1			
8		12				14		1			5		3		
	1	4		16		13	8	15	10						
3		5	13						9	6			8		
	4	13	9									16			
5			8		2			6			9				12
12			3	9	14			16	1					2	
2		6				10	1	13	11			5		8	7

Puzzle 1 Problems

1. Find the determinant of the following matrix:

$$\begin{bmatrix} (1,2) & (3,7) & (6,9) & (3,1) & (8,6) & (9,9) & (1,7) & (8,2) \\ (6,1) & (3,7) & (8,4) & (5,6) & (9,2) & (1,5) & (3,9) & (2,7) \\ (9,6) & (8,1) & (8,6) & (6,5) & (7,5) & (4,2) & (3,7) & (8,6) \\ (1,3) & (7,7) & (8,4) & (3,6) & (8,9) & (2,2) & (3,5) & (5,4) \\ (3,9) & (6,4) & (8,1) & (7,3) & (9,4) & (7,2) & (5,2) & (6,5) \\ (2,3) & (1,6) & (3,4) & (4,9) & (1,9) & (8,2) & (7,5) & (3,6) \\ (9,6) & (8,1) & (8,6) & (6,5) & (7,5) & (4,2) & (3,7) & (8,6) \\ (1,7) & (2,3) & (6,1) & (1,9) & (4,4) & (2,1) & (2,5) & (8,7) \end{bmatrix}$$

2. Celebrity chef Paula Dean charges restaurant venues **(2,8)** pound(s) of Tibetan yak butter plus an additional **(7,6)** pound(s) of Scandinavian goat butter per customer served to cook at events. Tibetan yak butter costs $765 per pound and Scandinavian goat butter costs $540 per pound. The restaurant venue knows that they can get 10,000 – 10x customers, where x is the price of the meal for one individual. What should the price of the meal for one individual be if the restaurant wants to maximize profit?
3. Dr. Morris wants this test to be very simple to grade. As the test writer, I earn **(7,4)** additional units of fun for every question that I make difficult to grade. If I begin with an initial 2 units of fun before beginning to write the test, what is the ones digit of the potential units of fun I could have had?
4. If I have a recipe for mayonnaise cake that calls for **(5,8)** gallons of mayonnaise, but I only have a teaspoon to measure with, how many scoops of mayonnaise should I add to my mixing bowl?
5. I have a stack of **(5,9)** pancakes, each of a different flavor. I also have **(8,7)** pieces of jam, each with a different flavor. If I can control which single jam goes on top of each pancake (one jam per pancake), and I can control in which order the pancakes are stacked, how many different stacks can I have? Two stacks differ if their sequence of pancakes or sequence of jams are different.

6. There's a hole in the bottom of the freshwater sea. In the hole in the bottom of the sea is a bucket and in the bucket there's a hermit crab. His name is Herman. Herman weighs **(3,7)** g. The bucket weighs **(9,2)** hg. The volume of the water in the hole is equal to **(7,6)** × 10**(6,3)** cubic centimeters. What is the total weight, in g, of the contents of the hole in the bottom of the sea?
7. A wainwright makes wagons with either **(6,1)** or **(5,2)** or **(8,4)** wheels. If there are 385 wheels and 49 wagons, and if the number of wagons with **(5,2)** wheels exceeds the number of wagons with **(6,1)** wheels by 17, how many of each wagon is there? Write your answer as the number of wagons separated by commas, in ascending order by number of wheels.
8. Solve for the sum of all real x:

   $\mathbf{(5,9)}\log_x \mathbf{(1,9)} + \log_{\mathbf{(8,8)}} x = \log_{\mathbf{(6,2)}} 32 - \log_{64} x$
9. The broccollama needs to eat **(9,3)** pounds of broccoli every day to survive. If a broccollama has already eaten **(2,1)** servings of **(6, 7)** ounces, how many ounces of broccoli does the broccollama still have to eat?
10. If Matt Damon has been stranded on a new planet that is **(1,6)** times further from Earth than the moon, how far, in km, is he from Earth?

Puzzle 2 Problems

11. **(6,2)** = ?
12. **(7,11)** + **(13,3)** = ?
13. **(9,3)** + **(1,10)** $^{\mathbf{(1,11)}}$ × **(12,6)** ÷ **(9,10)** = ? (Round to the nearest whole number.)
14. **(4,12)** ÷ **(5,2)** + **(6,15)** - **(11,16)** ÷ **(13,7)** × **(8,14)** = ? (In fractional form.)
15. $(\mathbf{1},\mathbf{9})^{(\mathbf{11},\mathbf{7})^{(\mathbf{6},\mathbf{15})^{(\mathbf{12},\mathbf{8})}}}$ = ?
16. x = **(2,4)**

    y = **(7,14)**

    z = **(9,5)**

    $x^3 + y^3 + z^3 - 3xyz - (x + y + z)(x^2 + y^2 + z^2 - yz - zx - xy) = ?$

17. Farmer Fred has a fenced off lot for his chickens. The lot is **(6,1)** feet wide and **(16,14)** long. One day, Farmer Fred decides to also raise foxes, which eat chickens; however, he cannot afford more land. In order to separate the lot into two sections, Farmer Fred wants to use a straight fence in the least efficient way possible (the longest length of straight fence). The new length must fit within the old rectangle. How long is this new length of fence?

18. $\det\begin{bmatrix} (\mathbf{11},\mathbf{13}) & (\mathbf{14},\mathbf{3}) & (\mathbf{1},\mathbf{7}) \\ (\mathbf{5},\mathbf{10}) & (\mathbf{2},\mathbf{12}) & (\mathbf{4},\mathbf{8}) \\ (\mathbf{9},\mathbf{15}) & (\mathbf{16},\mathbf{6}) & (\mathbf{9},\mathbf{10}) \end{bmatrix} = ?$

19. $\frac{d}{dx}\left((\mathbf{1},\mathbf{3})\boldsymbol{x}^{\mathbf{6}} + (\mathbf{7},\mathbf{13})\boldsymbol{x}^{\frac{(\mathbf{3},\mathbf{7})}{(\mathbf{8},\mathbf{9})}} + (\mathbf{15},\mathbf{5})\boldsymbol{x}^{\mathbf{3}} - (\mathbf{12},\mathbf{10})\boldsymbol{x}^{\frac{\mathbf{7}}{\mathbf{5}}}\right) = ?$

20. $\frac{(\mathbf{14},\mathbf{13})+(\mathbf{5},\mathbf{6}) \times (\mathbf{11},\mathbf{2}) - (\mathbf{10},\mathbf{16}) \div (\mathbf{1},\mathbf{9}) - (\mathbf{3},\mathbf{7}) + (\mathbf{8},\mathbf{12}) - (\mathbf{4},\mathbf{15})}{(\mathbf{8},\mathbf{12}) - \left((\mathbf{1},\mathbf{9}) \div (\mathbf{10},\mathbf{16})\right)^{-1} + (\mathbf{14},\mathbf{13}) - (\mathbf{4},\mathbf{15}) + (\mathbf{11},\mathbf{2}) \times (\mathbf{5},\mathbf{6}) - (\mathbf{3},\mathbf{7})} = ?$

Part Two

(Number Twenty One) Find the jerk of the position function given by x to the eighth plus seven x to the fourth minus three x squared minus x cubed times x squared.

(Number Twenty Two) Add all the numbers in the following paragraph and then divide that by half of the quantity five less than the number of numbers in the paragraph:

At three AM, I woke up for my four cups of five star coffee. I counted the drops of dew on my two kitchen windows while I poured myself another seven cups of coffee. It was too early for the morning news at seven so I kept finding things to count. In addition to the three-hundred-sixty-seven drops of dew, I counted the number of ice cubes in my three freezers. This took a while so as I completed the final few: four-hundred-fifty-two, four-hundred-fifty-three, the blaring theme of Fox News at seven came on. In my head I counted down: five, four, three, as the numbers flashed on the television screen. Five, four, three, two, one.

(Number Twenty Three) Find three times the integral from three to five of the function four x to the fourth plus three x cubed minus five x squared plus three with respect to x.

(Number Twenty Foooour) How much wood could a wood chuck chuck if a woodchuck would chuck wood? Not really, but actually the question is how many times does the letter "o" or "O" appear in this question, starting from the "Number" and gooing all the way too this next question mark?

(Number Twenty Five) If you add the year that Leonardo DiCaprio won an Oscar, the age of Justin Bieber in January 2014, and the number of days of summer vacation according to Phineas and Ferb, then multiply that sum by the number of potentially inhabitable worlds where data was sent back by the Lazarus expedition in *Interstellar*, what is the sum of the digits of the result?

(Number Twenty Six) What is the sum of the number of words (sequences of letters separated by spaces) and the number of characters (not counting spaces) on this page?

(Number Twenty Seven) According to the ham sandwich theorem, if I have a seven dimensional bagel sandwich, how many hyperplanes do I need to divide that bagel sandwich in half and how many dimensions will that/those hyperplane(s) be in? Answer in the form of "number of planes, number of dimensions."
(Number Twenty Eight) Find the sum of the coefficients of the snap, crackle and pop of the position function whose velocity function is eleven x to the fifth plus two x to the fourth minus seven x cubed minus x squared plus negative four x minus one.
(Number Twenty Nine) According to the chicken nugget theorem, what is the greatest number of chicken McNuggets that I cannot buy from McDonald's if they only sell 9 packs and 20 packs?
(Number Thirty) Find the inverse of the three by three matrix which reads from left to right, beginning with the top row and working downward: three, seven, two, five, zero, seven, ten, four, sixteen. Write your answer using fractions.