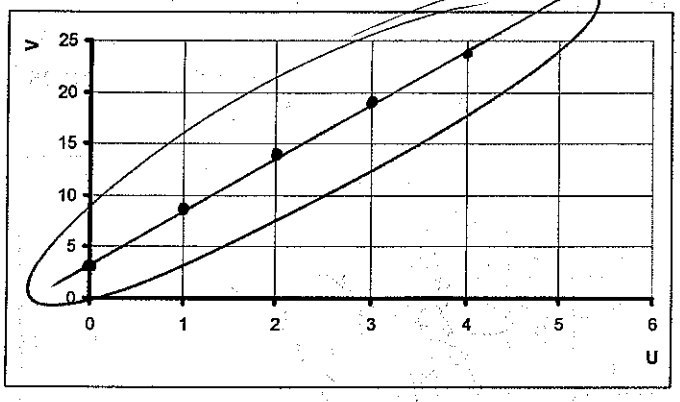
MATH 230
Test #3

Name_____
Spring 2006

1. (8 points) Consider the relationship expressed in the table below.

U	V
0	3
1	8
2	13
3	18
4	23



a. Plot the data points using the grid provided above.

b. Use the space below to explain and show how to determine a functional equation for the relationship between the values of V and U. Identify that functional equation.

The slope is = 5
The y-intercept is 3
So my equation is $V = 5U + 3$

c. Show how to use your functional equation to find the value of V when U = 10.

$5(10) + 3 = 53$ So, $V = 53$ when $U = 10$

d. Show how to use your functional equation to find the value of U when V = 43.

$43 = 5U + 3$
$40 = 5U$
$U = 8$
So, $U = 8$ when $V = 43$

2. (8 points) Consider the relationship expressed in the table below. Assume the observed pattern of differences continues indefinitely.

n	0	1	2	3	4	5	6	7
C_n	2	4	10	20	34	52	74	100

2 6 10 14 18 22 26
4 4 4 4 4 4

a. Complete the table by entering the values for C_0, C_6, and C_7.

b. Complete the following rule that specifies a difference equation for the relationship.

$C_0 =$ 2

$C_n = C_{n-1} +$ $4n - 2$

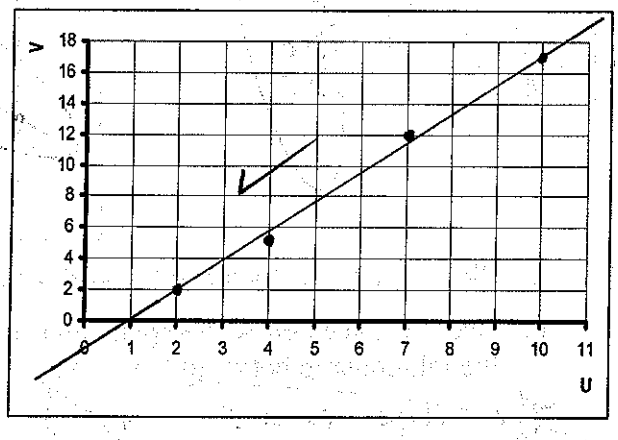
c. Complete the following rule to specify an explicit functional equation for this relationship.

$C_n =$ $2n^2 + 2$.

3. (8 points) Plot the data below on the grid provided for that purpose. Sketch a line that you think provides a good fit to the data.

a. Explain why you drew the line where you did.
b. Show how to find an equation for the line you drew. Write out that equation.
c. Complete the table by entering the V values determined by your line.
c. Show how to use your equation to estimate predicted values for V when U = 0 and when U = 15.

U	V	My Model Predicts
0		$-\frac{7}{4}$
2	2	
4	5	$5\frac{3}{4}$
7	12	$11\frac{3}{8}$
10	17	17
15		$26\frac{3}{8}$



(a) My line comes close to all the points

(b) My line passes through

U	V
2	2
10	17

$\Delta U = 8 < \Delta V = 15$

My line has slope $\frac{15}{8}$

$V = \frac{15}{8}U + \left[\frac{-7}{4}\right]$

$\frac{16}{8} - \frac{30}{8} = \frac{-14}{8} = -\frac{7}{4}$

My line: $V = \frac{15}{8}U - \frac{7}{4}$

4. (8 points) Consider the relationship expressed in the table below. Assume the observed pattern of differences continues indefinitely.

n	0	1	2	3	4	5	6	7
S_n	32	48	72	108	162	243	364.5	546.75
ratio		1.5	1.5	1.5	1.5	1.5		

a. Show how to calculate S_6 and S_7.

$1.5 \times 243 = 364.5$
$364.5 \times 1.5 = 546.75$

b. Write a difference equation for the relationship between S_n and n.

$S_0 = 32$
$S_n = 1.5\, S_{n-1}$

c. Write an explicit functional equation for the relationship between S_n and n.

$S_n = 32(1.5)^n$

d. Find ~~the smallest value~~ of n for which $S_n \geq 1000$

$S_9 = 1230.1875 \geq 1000$

In working the following problem, be sure to identify any variables you introduce, and clearly and appropriately state any conclusions using complete sentences.

5. (8 points) Scuba divers are subject to the effects of increasing pressure as they go deeper and deeper into the ocean. As a rule of thumb, divers use the following rule. At the surface, depth zero feet, the water exerts a pressure of 15 pounds per square inch. For every additional 33 feet of depth, the pressure increases by 15 pounds per square inch. So, at a depth of 33 feet, the pressure is 30 pounds per square inch.

(a) Write a functional model to determine the pressure given a depth.

let D = depth in feet
P = pressure in lbs/in²

$P = \frac{15}{33}D + 15$

ΔD	D	P	ΔP
	0	15	15
33	33	30	
	66	45	

slope = $\frac{15}{33}$

(b) What is the pressure at a depth of 100 feet?

$P = \frac{15}{33}(100) + 15 = 60.45$

So at 100' the pressure is 60.45 lbs/in²

(c) Suppose an underwater camera can withstand pressures up to 1,000 pounds per square inch. How deep can the camera go in the ocean safely? (Show your calculations.)

$1000 = \frac{15}{33}(D) + 15$

$985 = \frac{15}{33}D$

$2167 = D$

So the camera can safely go 2167 ft deep