Modelling Quadratic Relations

Complete the chart below.

EQUATION	TABLE OF VALUES					GRAPH

Row 1:

The distance travelled by a boy on a bike is modelled by the equation $y = 3x$.

x	$3x$	y	1st	2nd
0	$3(0)$	0	3 - 0 = 3	3 - 3 = 0
1	$3(1)$	3	6 - 3 = 3	3 - 3 = 0
2	$3(2)$	6	9 - 6 = 3	3 - 3 = 0
3	$3(3)$	9	12 - 9 = 3	
4	$3(4)$	12		

Row 2:

The height of a falling marble is recorded and modelled by the equation $y = -5x + 2$.

x	$-5x + 2$	y	1st	2nd
0	$-5(0) + 2$	2	-5	
1	$-5(1) + 2$	-3	-5	
2	$-5(2) + 2$	-8	-13--8 = -5	
3	$-5(3) + 2$	-13	-18--13 = -5	
4	$-5(4) + 2$	-18		

Row 3:

The height of a ball thrown by a child is modelled by the equation $y = -2x^2 + 8$.

x	$-2x^2 + 8$	y	1st	2nd
0	$-2(0)^2 + 8$	8	-2	-4
1	$-2(1)^2 + 8$	6	-6	-4
2	$-2(2)^2 + 8$	0	-10	-4
3	$-2(3)^2 + 8$	-10	-14	
4	$-2(4)^2 + 8$	-24		

Row 4:

The depth of a submarine is tracked and modelled by the equation $y = x^2 - 30x + 125$.

x	$x^2 - 30x + 125$	y	1st	2nd
5	$(5)^2 - 30(5) + 125$	0		
10	$(10)^2 - 30(10) + 125$	-75		
15	$(15)^2 - 30(15) + 125$	-100		
20	$(20)^2 - 30(20) + 125$	-75		
25	$(25)^2 - 30(25) + 125$	0		

A **MATHEMATICAL MODEL** is a mathematical description of a real situation.

Use the real-life models you completed to **SUMMARIZE** the differences between *linear* and *quadratic* relations.

Type of Mathematical Model	Linear Relations	Quadratic Relations
EQUATION OR DEGREE	$y = mx + b$ degree 1 polynomial (highest power on x is one)	$y = ax^2 + bx + c$ (standard form) degree 2 polynomial (highest power on x is 2)
TABLE OF VALUES OR DIFFERENCE TABLE	1st differences are the same	2nd differences are the same
GRAPH OR DIAGRAM	straight line ↗	symmetrical U-shaped curve called parabola

Example 1

Examine each equation. Determine the **degree** and the **type of relation** it represents (linear, quadratic or neither).

$y = -5x + 18$	$y = 6x^3 + 2x - 1$	$y = 2x^2 + 7x - 1$
Degree: ____1____	Degree: ____3____	Degree: ____2____
Type: ___linear___	Type: __neither (cubic)__	Type: __quadratic__

Example 2

Complete each table. Determine the **type of relation** it represents. Give a **reason** for your answer.

x	$-2x + 1$	y	1st	2nd
-4	$-2(-4)+1$	9	-4	
-2	$-2(-2)+1$	5	-4	✗
0	$-2(0)+1$	1	-4	
2	$-2(2)+1$	-3	-4	
4	$-2(4)+1$	-7		

Type: ___linear___

Reason: ___1st differences constant___

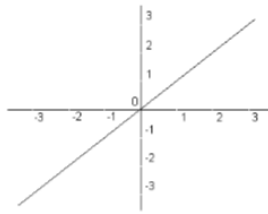| x	$2x^2 - 3$	y	1st	2nd
-2	$2(-2)^2 - 3$			
-1	$2(-1)^2 - 3$			
0	$2(0)^2 - 3$			
1	$2(1)^2 - 3$			
2	$2(2)^2 - 3$			

Type: _____

Reason: _____

Name: _____

Example 3

Examine each graph. Determine the **type of relation** it represents. Give a **reason** for your answer.
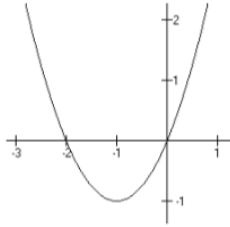
Type: _quadratic_ Reason: _u-shaped curve_	Type: _linear_ Reason: _straight line_