W1 – Intro to Quadratics Unit 4

MPM2D

Jensen

1) Use finite differences to determine if each relation is linear, quadratic, or neither.

a)

x	y
0	4
1	5
2	6
3	7
4	8
0	4

b)

x	y
0	3
1	4
2	7
3	12
4	19
0	3

c)

x	y
1	0
3	1
5	8
7	27
9	64
1	0

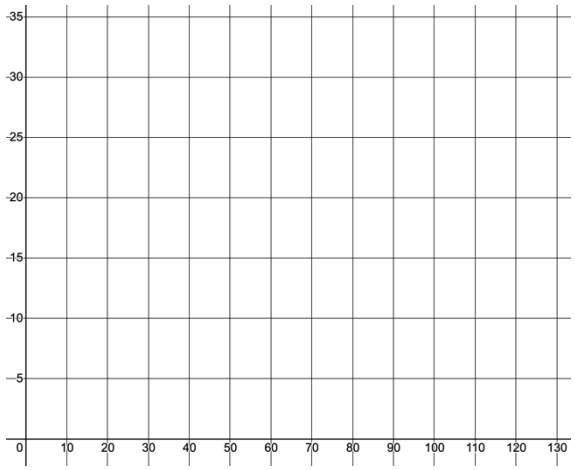
d)

x	y
-2	6
1	0
4	12
7	42
10	90
-2	6

2) The parabolic shape of the Humber River Pedestrian Bridge in Toronto can be approximated by the equation $h = -\frac{1}{144}x^2 + \frac{5}{6}x$, where x is the horizontal distance, in meters, from one end and h is the height, in meters, above the water.

a) Graph the quadratic relation using a table of values

x	y
0	
20	
40	
60	
80	
100	
120	



b) What is the height of the bridge 12 meters horizontally from one end?

c) How wide is the bridge at its base?

d) What is the maximum height of the bridge and at what horizontal distance does it reach that height?

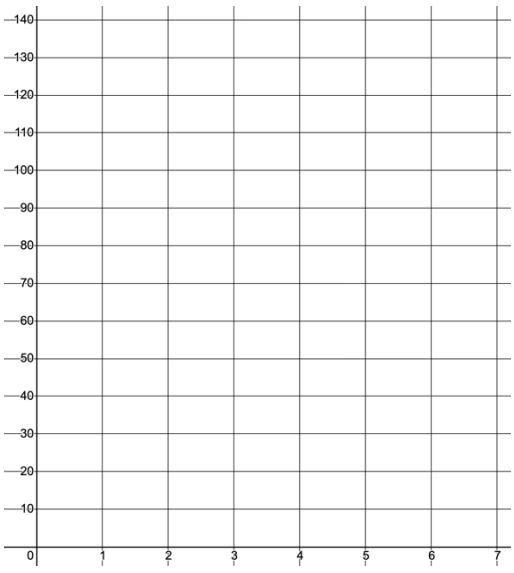
e) Identify the axis of symmetry of the bridge.

3) A flying bird drops a seed that it had picked up off the ground. The height, h, in meters, of the seed above the ground can be modelled by the relation $h = -5t^2 + 125$, where t is seconds since the seed was dropped.

a) At what height was the seed dropped from?

b) Graph the quadratic relation using a table of values.

x	y
0	
1	
2	
3	
4	
5	



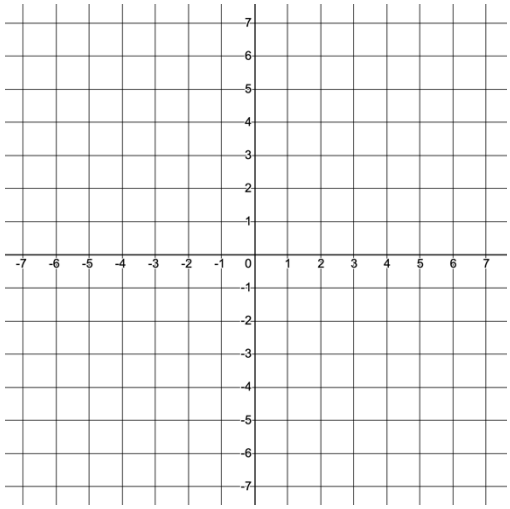
c) How long does it take from when the bird drops the seed until it hits the ground?

4) How can you tell if the vertex of a parabola is a maximum or minimum without graphing?

5) State the direction of opening and y-intercept of the given quadratic, then make a table of values and sketch the graph to verify.

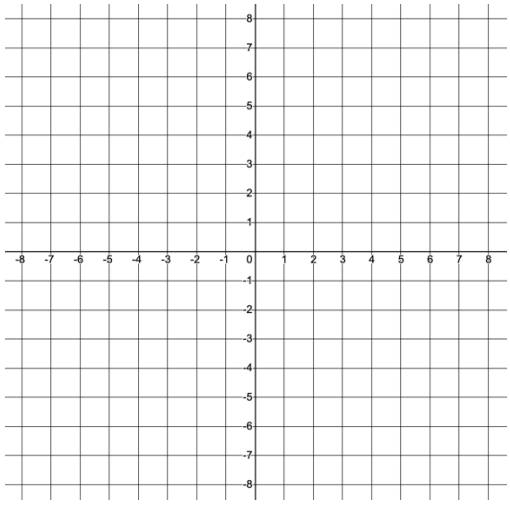
a) $y = x^2 + 2x - 3$

x	y
-4	
-3	
-2	
-1	
0	
1	
2	



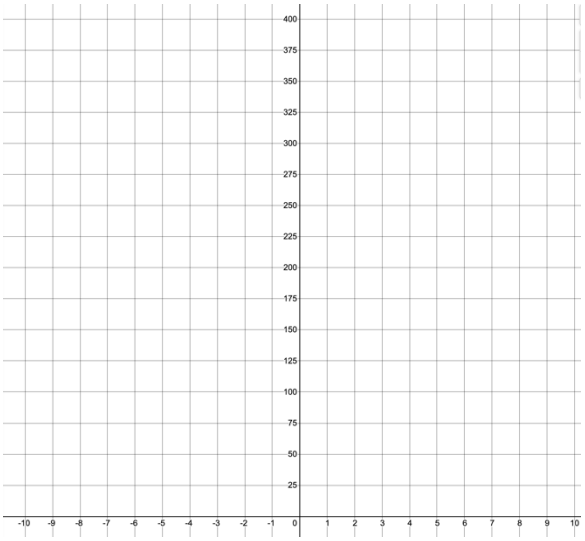
b) $y = -x^2 - 8x - 12$

x	y
-7	
-6	
-5	
-4	
-3	
-2	
-1	



6) An object dropped from the top of the Empire State Building has a height in meters from the ground, y, at any time in seconds, x, according to the formula: $y = -4.84x^2 + 381$

a) Using graphing technology to help you make a rough sketch of the graph of the function.



b) What is the vertex? Interpret the meaning of the vertex in this context.

c) Find the x-intercepts and interpret their meaning in this context.

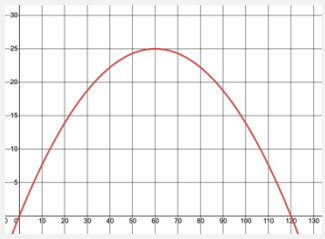
d) How far from the ground is the object after 3 seconds.

Answers

1)a) linear **b)** quadratic **c)** neither **d)** quadratic

2)a)

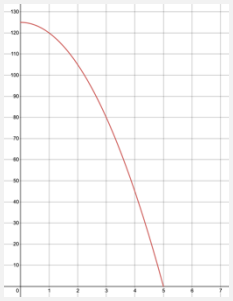
x	y
0	0
20	13.9
40	22.2
60	25
80	22.2
100	13.9
120	0



b) 9 m **c)** 120 m **d)** max height of 25 m at a horizontal distance of 60 m **e)** $x = 60$

3)a) 125 m **b)**

x	y
0	125
1	120
2	105
3	80
4	45
5	0

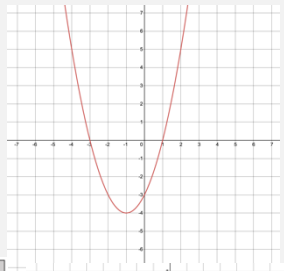


c) 5 seconds

4) By looking at the leading coefficient (the coefficient of the x^2 term). If the leading coefficient is positive, the parabola opens up and has a minimum point. If the leading coefficient is negative, the parabola opens down and has a maximum point.

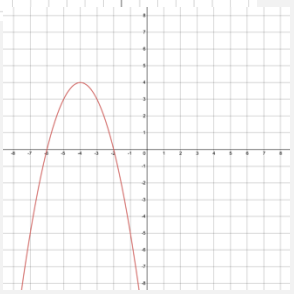
5)a) opens up; y-int at $(-3,0)$

x	y
−4	5
−3	0
−2	−3
−1	−4
0	−3
1	0
2	5

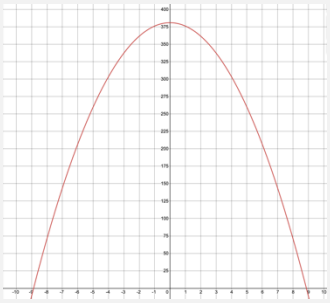


b) opens down; y-int at $(0,-12)$

x	y
−7	−5
−6	0
−5	3
−4	4
−3	3
−2	0
−1	−5



6)a)



b) $(0,381)$, the object is dropped from a height of 381 meters

c) The x-intercepts are at ± 8.872. The negative -8.872 x-intercept can be ignored since it does not fit the domain of this scenario. The x-intercept of 8.872 means that it took 8.872 seconds for the object to hit the ground.

d) 337.44 meters