SOLUTION

Rates of change: Follow up to first and second differences activity Date: _____

1. Consider scenarios (Ferris wheel, and cubic). Notice that the first and second differences are consistently positive or consistently negative over different intervals of x.

What is happening in the original graph when:

a) the first differences are positive?

slope is +ve
graph is increasing

b) the first differences are negative?

slope is -ve
graph is decreasing

c) the first differences change from positive to negative?

turning point (maximum)

d) the first differences change from negative to positive?

turning point (minimum)

e) the second differences are positive?

- rate of change is increasing
(graph is concave up)

f) the second differences are negative?

- rate of change is decreasing
(graph is concave down)

g) the second differences change from positive to negative?

inflection point
(concave up to concave down)

h) the second differences change from negative to positive?

inflection point
(concave down to concave up)

2. Consider the graphs of the first differences as you answer each of the following.

a) Over the interval where the second differences are positive, what can you say about the graph of the first differences?

first differences are increasing

b) Over the interval where the second differences are negative, what can you say about the graph of the first differences?

first differences are decreasing

c) When the second differences change from positive to negative, what can you say about the graph of the first differences?

- first difference graph has a maximum
- original graph has an inflection point

d) When the second differences change from negative to positive, what can you say about the graph of the first differences?

- first difference graph has a minimum
- original graph has an inflection point

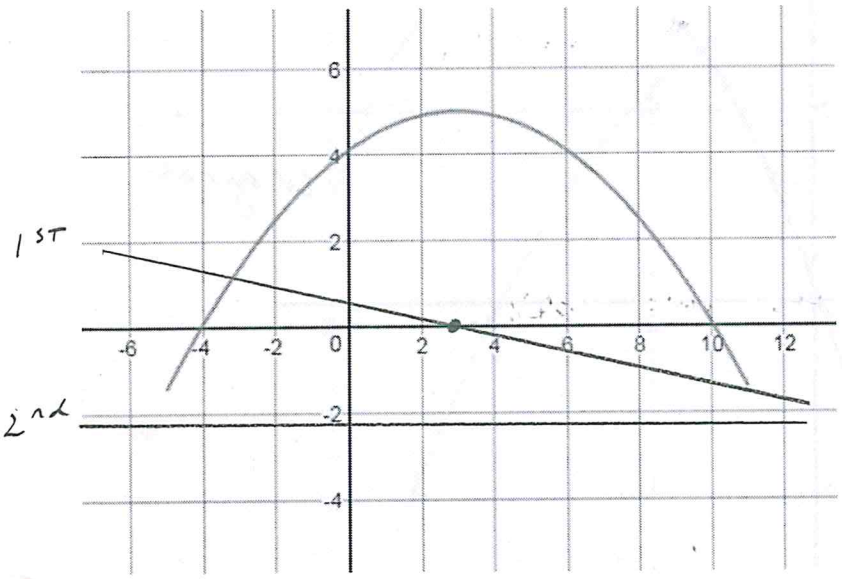
3. Complete the following table as a summary of your findings.

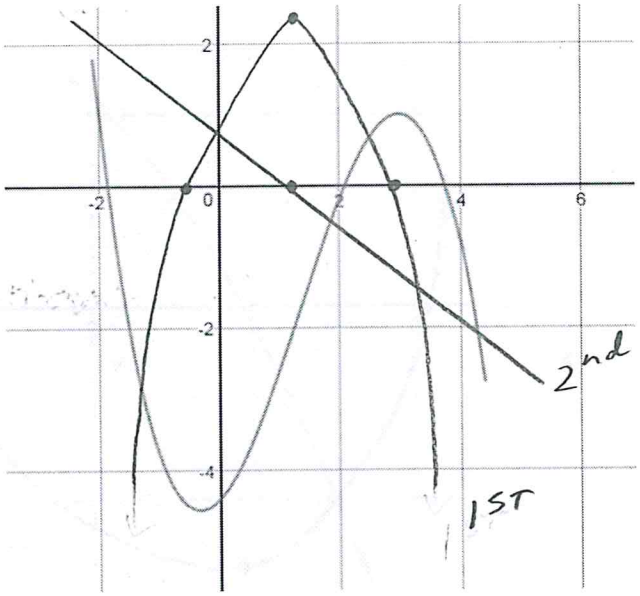
Original Graph	Average rate of change graph	Average rate of change graph of the average rate of change
Positive		
Zero		
Negative		
Increasing	+ve	
Turning point	0	
Decreasing	-ve	
Concave Up	Increasing	+ve
Inflection	TP	0
Concave Down	Decreasing	-ve

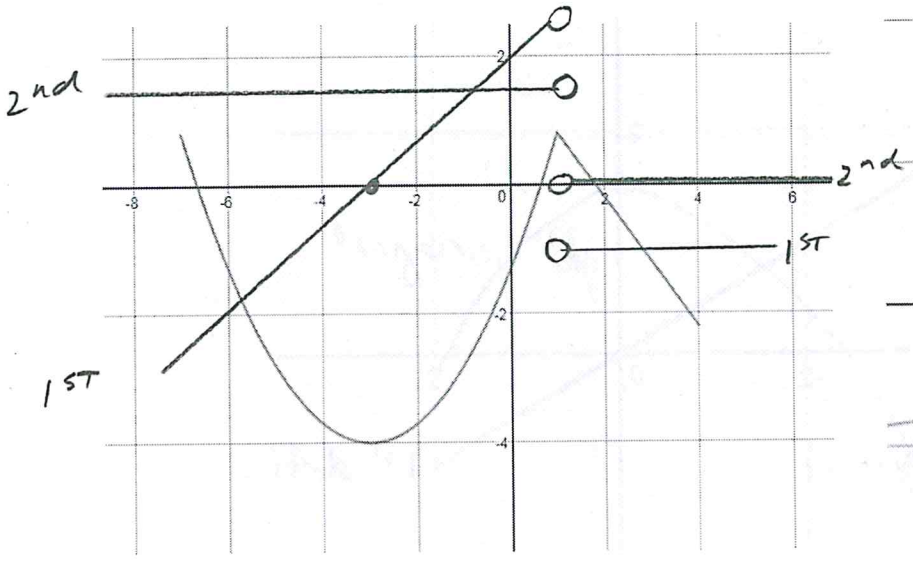
SOLUTION

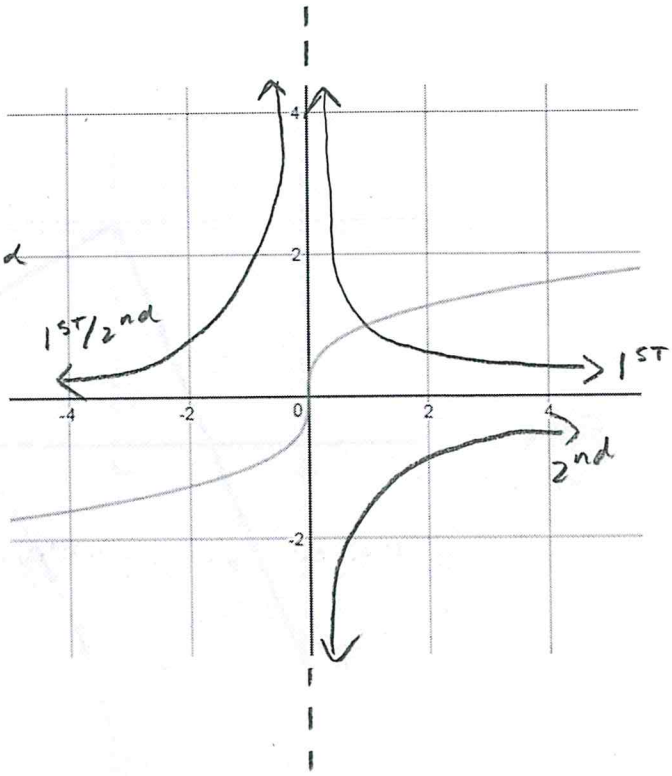
Practice:

For each graph, sketch a graph for the first and second differences. Do not worry about scale, focus on alligning key characterisitics.









Each of the following is a graph of the first differences. Sketch a graph that could be the original graph.