## Activity - Extreme Values

**Part 1.** Consider the function h given by the graph in Figure below. Use the graph to answer each of the following questions.

- (a) Identify all of the values of c for which h(c) is a local maximum of h.
- (b) Identify all of the values of c for which h(c) is a local minimum of h.

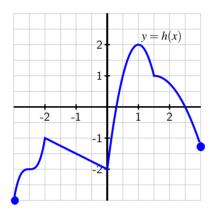


Figure: The graph of a function h on the interval [-3,3].

- (c) Does h have a global maximum? If so, what is the value of this global maximum?
- (d) Does h have a global minimum? If so, what is its value?
- (e) Identify all values of c for which h'(c) = 0.
- (f) Identify all values of c for which h'(c) does not exist.
- (g) True or false: every relative maximum and minimum of h occurs at a point where h'(c) is either zero or does not exist.
- (h) True or false: at every point where h'(c) is zero or does not exist, h has a relative maximum or minimum.

## Part 2.

Suppose that g(x) is a function continuous for every value of  $x \neq 2$  whose first derivative is  $g'(x) = \frac{(x+4)(x-1)^2}{x-2}$ . Further, assume that it is known that g has a vertical asymptote at x=2.

- (a) Determine all critical numbers of g.
- (b) By developing a carefully labeled first derivative sign chart, decide whether g has as a local maximum, local minimum, or neither at each critical number.

- (c) What is the value of  $\lim_{x\to\infty} g'(x)$ ? What does the value of this limit tell you about the long-term behavior of g?
- (d) Does g have a global maximum? global minimum? Justify your claims.
- (e) Sketch a possible graph of y = g(x).