

## Chapter 3 Checklist

### Absolute Extrema

1. Find the coordinates of the endpoints.
2. Find the critical numbers.
3. Find the coordinates of critical numbers.
4. Which are the highest and lowest coordinate?

### Rolle's Theorem

1. Is the function continuous [a,b]?
2. Does  $f(a) = f(b)$ ?
3. Is the function differentiable (a,b)?
4. Solve  $f'(x) = 0$ .

### Mean Value Theorem

1. Is the function continuous [a,b]?
2. Is the function differentiable (a,b)?
3. Find the slope from point a to point b.  $m = \frac{f(b) - f(a)}{b - a}$
4. Solve  $f'(x) = m$ .

### Increasing or Decreasing Functions

1. Find the critical numbers
2. Make a table with the critical numbers as the break points.
3. Plug value(s) from the intervals into the 1<sup>st</sup> derivative.
4. If  $f'(x) = -$ , then the function is **decreasing**. If  $f'(x) = +$ , then the function is **increasing**.

### Relative Extrema

1. Find the critical numbers
2. Use 1<sup>st</sup> Derivative Test or 2<sup>nd</sup> Derivative Test to tell if it is a relative maximum or relative minimum.
3. Find the coordinates and label accordingly.

### Points of Inflections

1. Find the 2<sup>nd</sup> derivative.
2. Set  $f''(x) = 0$  or where  $f''(x)$  does not exist.
3. Make a table with the possible points of inflections as the break points.
4. If the concavity changes, then that break point is a point of inflection where the coordinate exists.

### Concavity

1. Find possible points of inflections by setting  $f''(x) = 0$  or where  $f''(x)$  does not exist.
2. Make a table with the possible points of inflections as the break points.
3. If  $f''(x) = -$ , then the function is **concave down**. If  $f''(x) = +$ , then the function is **concave up**.

### Vertical Asymptotes

1. It must be a rational equation.
2. Factor and cancel if possible.
3. Set the denominator equal to zero and solve.
4. Plug result into equation. If the result is a  $\frac{\text{non-zero}}{\text{zero}}$  value, then that x value is a vertical asymptote.

### Horizontal Asymptotes

1. It must be a rational equation.
2. Factor and cancel if possible.
3.  $\lim_{x \rightarrow \pm\infty} f(x) = \text{Horizontal Asymptote(s)}$ .

### Optimization

1. List the given information and draw a diagram.
2. Recognize the primary and secondary equations.
3. Plug secondary equation into primary equation.
4. Find relative extrema of the new primary equation.
5. Re-read the problem and answer the question.

### Propagated Error

1. List the given information and draw a diagram.
2. Find the differential.
3. Plug in the given data and calculate propagated error.