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. $m = \dfrac{f(b) - f(a)}{b - a}$
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 1st 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 1st Derivative Test or 2nd 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 2nd 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 $\dfrac{non - zero}{zero}$ 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. $\lim\limits_{x \to \pm\infty} f(x) =$ 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.