**Learning Objectives**

(1) By the end of the section, students will be able to do computational examples for each of the main topics for the midterm

(2) By the end of the section, students will have done exercises for more difficult concepts.

**Notes**

Chapter 2: Limits

2.2 Limits

- Verify by definition
- One-sided limits
- Infinite limits

2.3 Limit Laws

- Computing limits

2.4 Limits and continuity

- Types of discontinuities
- Left and right continuity
- Showing continuity
- Piecewise functions

2.5 Indeterminate forms

2.6 Squeeze Theorem and Trig Limits

2.7 Limits at Infinity

2.8 IVT

Chapter 3: Derivatives

3.1 Definition of derivative

- Evaluating $f'(a)$ as a limit
- Tangent lines

3.2 Derivative as a function

- Computations
- Graphs

3.3 Product and Quotient Rule

3.5 Higher derivatives

- Computation
- Interpretation/graphs

3.6 Trigonometry derivatives

3.7 Chain Rule

**Exercises**

2.3.33 Can the Quotient Law be applied to evaluate $\lim_{x\to 0} \frac{\sin x}{x}$?

*Solution.* No, the individual limits don't exist. □

2.3.34 Show that the Product Law cannot be used to evaluate the limit

$$\lim_{x\to \frac{\pi}{2}} (x - \frac{\pi}{2}) \tan(x)$$

*Solution.* The limit for tan doesn't exist. □

2.6.6 Evaluate the limit using the Squeeze Theorem

$$\lim_{x\to 0^+} \sqrt{x} 3^{\cos(\pi/x)}$$

*Solution.* $\frac{1}{3} \leq 3^{\cos(\pi/x)} \leq 3$ □

2.8.6 Use the IVT to find an interval of length $\frac{1}{2}$ containing a root of $f(x) = x^3 + 2x + 1$.

*Solution.* Note that $f(0) = 1 >$ and $f(-1) = -2 < 0$. Then use bisection method on $[-1, 0]$. □

3.5.P Convert into math: "The rate of increase of inflation is decreasing"

*Solution.* Let $I(t)$ be inflation as a function of time. Then the rate of increase of $I$ is $I'(t)$. If $I'(t)$ is decreasing, then $I''(t) < 0$. □