

# Recitation 4

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## 1 Sandwich Theorem

### 1.1 Examples

$$1.1.1 \quad \lim_{x \rightarrow \infty} \frac{5x^2 - \sin(3x)}{x^2 + 10}$$

$$\begin{aligned} \frac{5x^2 - 1}{x^2 + 10} &\leq \frac{5x^2 - \sin(3x)}{x^2 + 10} && \leq \frac{5x^2 + 1}{x^2 + 10} \\ \therefore \frac{5 - \frac{1}{x^2}}{1 + \frac{10}{x^2}} &\leq \frac{5x^2 - \sin(3x)}{x^2 + 10} && \leq \frac{5 + \frac{1}{x^2}}{1 + \frac{10}{x^2}} \end{aligned}$$

$$\therefore \lim_{x \rightarrow \infty} \frac{5x^2 - \sin(3x)}{x^2 + 10} = 5$$

## 2 Intermediate Value Theorem

If  $f$  is continuous over  $[a, b]$ , then,  $\forall h$  between  $f(a)$  and  $f(b)$ ,  $\exists c \in [a, b]$ , s.t.  $f(c) = h$

## 3 Weierstrauss Theorem

If  $f$  is continuous over  $[a, b]$ , then,  $f$  has a maximum and a minimum in  $[a, b]$ .