\[ y = \frac{1}{n} \ln \left( \ln \left( \frac{x}{e} \right) \right) \]

\[ \lim_{x \to +\infty} \left( 1 + \frac{e}{x} \right)^x = e \]

\[ \lim_{n \to 0} (\ln(n) + x) = 0 \]

Exam 2 is in 2 weeks. I'll start studying materials this week.
\[
\lim_{x \to 0^+} \left( \frac{\frac{x}{x} + 1}{\frac{(\frac{x}{x})}{1}} \right) = \lim_{x \to 0^+} \left( \frac{x + 1}{1} \right) = 1
\]
\[
\lim_{x \to 0^+} \frac{x^2}{\tan(2x) \cdot x^2(2x)^2}
\]

\[
= \lim_{x \to 0^+} \frac{\tan(2x)}{\tan(2x) \cdot 2x}
\]

\[
= \lim_{x \to 0^+} \frac{1}{2x}
\]

\[
= \frac{1}{0^+} = \infty
\]
\[
\begin{align*}
\lim_{x \to 0^+} \frac{\sin(2x)}{x} &= \lim_{x \to 0^+} \frac{2 \cos(2x)}{1} \\
&= 2 \cdot \frac{1}{1} \\
&= 2
\end{align*}
\]
f has local maximum of 1 at x = 1

f has local maximum of 5 at x = 5

Local max of 4 at x = 3

f(x) = x + 1

No extremum at x = 0, hence could be a local minimum, but no extremum

CH 4: Maxima et Minima (for functions)
For $f \to x = a$, you need either $f'(a) = 0$ or $f'(a)$ is non-existent.

**Equivalence:**

For $f$ to have a local max or min at $x = a$, then $f$ can not have a local max or min at $x = a$. i.e. $f'(a)$ exist and is $\neq 0$. Hence $f(a) \neq k \neq 0$.
The x-values where \( f \) could have a local max or min (i.e. where \( f'(x) = 0 \) or \( f'(x) \) DNE) and \( f(x) \) exists are called critical numbers for \( f \).

Technical def: \( f \) has a local maximum value at \( x = a \) iff there is an interval \( c < a < b \) such that \( f(a) \geq f(x) \).
for all \( x \) in \( c < x < b \).
4.1 15) \( f_2(x) = 8 - 3x, \quad x \geq 1. \)

\[ f_{61} = \begin{cases} 
8 - 3x, & x \\ 
1, & x < 1 
\end{cases} \]

NO local extrema.

Has an ABSOLUTE MAX VALUE of 5, \( a + x = 1. \)
If you know $f$ is continuous on $[a,b]$, then you know $f$ has absolute max and absolute min on $[a,b]$. Then you know $f$ is continuous on open interval $(a,b)$. The extreme value theorem.

No absolute extrema.
No local extrema.

$f(x) = x^2, 0 < x < 2$. 

$(4)$
If this is the case, could the graph be

$m \leq x \leq 3$.

$f(x) = x^2 - 3x + 1$

Find the absolute max and min.

4.1 \(38\)
Find critical points if they are between 0 and 3.

\[
\begin{align*}
f(3) &= 19 \\
\text{Critical point} &\Rightarrow f'(x) = 0 \\
&\Rightarrow 3x^2 - 3 = 3(x-1)(x+1) \\
&\Rightarrow x = 0, 1, -1
\end{align*}
\]