Week 3. 5 First talk at the calc example

Find the limit of Calculus (E) 09.09

Last week:

\[
\int_a^b f(x) \, dx = F(b) - F(a)
\]

when \( F(x) \) is differentiable and \( F(x) \) is continuous

This week: \( \frac{d}{dx} \left( \int_a^x f(t) \, dt \right) \) = ? when \( f(x) \) is continuous

(Albeit prove, we prove it in detail)

1) Extreme Value Theorem: If \( f \) is continuous on a closed interval \([a,b]\), then \( f \) attains an absolute maximum value \( f_c \) and absolute minimum value \( f_m \)

Let \( g(x) = \int_a^x f(t) \, dt \)

\[
\frac{(g(x+h) - g(x))}{h} = \frac{\int_a^{x+h} f(t) \, dt}{h}
\]
As \( h \to 0 \), \([x + h, x]\) \to x,

and \( m = \lim_{h \to 0} f(x) \) if \( m = \lim_{h \to 0} f(x + h) \) only?

Therefore \( \frac{df[x + h]}{dx} = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} = f'(x) \)

Find the derivative of \( \cos x \) (\( x \))

\( \frac{d}{dx} \left( \int_a^x f(t) \, dt \right) = f(x) \) if \( f \) is continuous at \( x \),
ex: 0 \[ g_w(x) = \int x^4 \, dt \]

\[ g'_w(x) = \sqrt{1 + x^2} \]

Q: \((\frac{d}{dx}) \left( \int x^4 \, dt + x^2 \right) = ? \)

\( \text{circle tile!} \)

\( \text{sec}(x^2) \sqrt{x^4} \)

2. derivative of \( g_{12} = \int x^5 \, dx \)

\( \int e^t \, dt = \int (1 + t) \, dt \)

\( h(x) = \int 3x^4 \, dx \)

6. \( \int e^{\frac{t}{2}} \cdot a(t) \, dt \)

\( h'(x) = (\cos(x))^\frac{1}{2} \cdot \cos \cdot \ln x \)

\( \int h(x) \, dx = \int \ln x \cdot h(x) \, dx \)

Fid the st at \( f(x) = \frac{1}{x} \)