

MTH 252Z Lab

The Fundamental Theorem of Calculus Part 1

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Prompts

1. The Fundamental Theorem of Calculus is the most important theorem of this course. This theorem has two parts, one of which we studied today. Explain in a few sentences what the first part of the Fundamental Theorem of Calculus tells us.
2. Let $f(x) = \cos x + \sin x$. Let $g(x) = \int_0^x f(t) dt$.
 - (a) Graph f in Desmos. Copy this graph onto your paper three times.
 - (b) Evaluate $g(0)$.
 - (c) Evaluate $g\left(\frac{\pi}{6}\right)$. On your first graph, draw a representation of $g\left(\frac{\pi}{6}\right)$.
 - (d) Evaluate $g\left(\frac{\pi}{4}\right)$. On your second graph, draw a representation of $g\left(\frac{\pi}{4}\right)$.
 - (e) Evaluate $g\left(\frac{\pi}{3}\right)$. On your third graph, draw a representation of $g\left(\frac{\pi}{3}\right)$.
 - (f) Find $\frac{d}{dx} \left(\int_0^x f(t) dt \right)$.
 - (g) Find $g'\left(\frac{\pi}{3}\right)$.
 - (h) What does $g\left(\frac{\pi}{3}\right)$ represent? What does $g'\left(\frac{\pi}{3}\right)$ represent?
3. Evaluate the following derivatives.
 - (a) $\frac{d}{dx} \left(\int_1^x \tan t dt \right)$
 - (b) $\frac{d}{dx} \left(\int_{\pi}^{x^2} \tan t dt \right)$
 - (c) $\frac{d}{dx} \left(\int_0^{\tan x} e^{t^2} dt \right)$
 - (d) $\frac{d}{dx} \left(\int_{10}^{\cos x} \frac{-1}{t} dt \right)$
4. If $f(x) = \ln \sqrt{1+x^2}$ and $g(x) = \int_x^{e^x} f(t) dt$ with $x > 0$, then find a formula for $g'(x)$.