

MA 181SECTION 5.4: THE FUNDAMENTAL THEOREM OF CALCULUS

1. The integral can be used to define a function

$$g(x) = \int_a^x f(t)dt \text{ where } f \text{ is continuous on } [a, b] \text{ and } a \leq x \leq b.$$

If x is a fixed number, $g(x)$ is a definite number.
If x acts as a variable, g is a function of x .

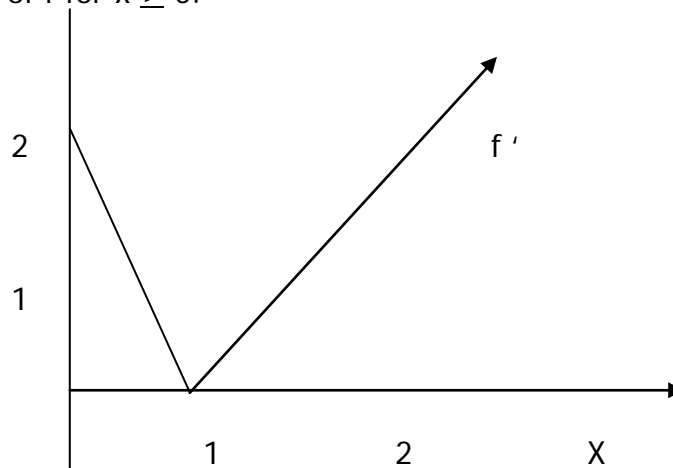
2. EXAMPLES: Find $g'(x)$

A. $g(x) = \int_1^x \ln t \, dt$

B. $g(x) = \int_{e^x}^0 \sin^3 t \, dt$

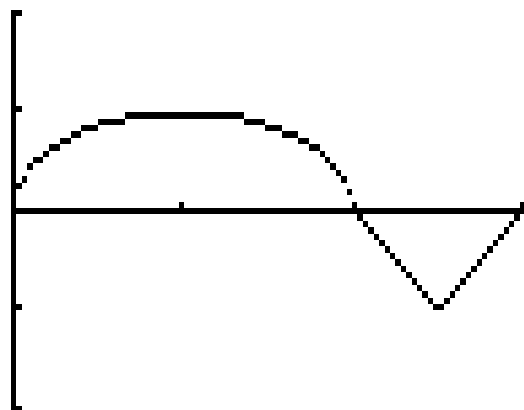
3. MORE EXAMPLES:

- A. Given the graph of the derivative of f and $f(0) = 0$, construct a sketch of the graph of f for $x \geq 0$.



Find, using the area under the curve, $f(1)$, $f(1.5)$, $f(2)$ and generalize $f(x)$ for $x > 2$.

- B. Given the graph of g' and assume $g(0) = 0$ construct a sketch of the graph of g on $[0, 3]$.



Find $g(1)$, $g(2)$, $g(2.5)$, $g(3)$ – plot points for sketch of g .