Notes: Fundamental Theorem of Calculus (Part II) Integration Day 6

$$A(x) = \int_a^x f(t)dt = signed\ Area\ from\ a\ to\ x$$

Fundamental Theorem of Calculus (Part II)

Let $f(x)$ be a continuous function on $[a, b]$.

Then $A(x) = \int_a^x f(t)\, dt$ is an antiderivative of $f(x)$, that

$A'(x) =$______________, or equivalently,

$\frac{d}{dx}\int_a^x f(t)\, dt =$_____________

What does that mean?

Evaluate: $\frac{d}{dx}\int_\pi^x sin(t)\, dt =$

Try Again: $\frac{d}{dx}\int_5^x t^2\, dt =$

Now what does it mean?

What happens if the upper limit is something other than plain x?

Evaluate: $\frac{d}{dx}\int_\pi^{x^2} sin(t)\, dt =$

Try Again: $\frac{d}{dx}\int_5^{3x^2} t^2\, dt =$

Fundamental Thm. of Calculus Part II

$\frac{d}{dx}\int_{constant}^{f(x)} f(t)\, dt =$________________

$$\frac{d}{dx}\int_{constant}^{f(x)} f(t)\, dt$$

Integration Day 6

Example 1: Evaluate each using the First Fundamental Theorem of Calculus (FFTC)

A. $\frac{d}{dx}\int_{0}^{x} sin^2(t)\, dt =$

B. $\frac{d}{dx}\int_{2}^{x} 3\text{t} + \cos(t^2)(t)\, dt =$

C. $\frac{d}{dx}\int_{7}^{x} \frac{1+t}{1+t^2}\, dt =$

D. $\frac{d}{dx}\int_{0}^{x^2} \text{e}^{t^2}(t)\, dt =$

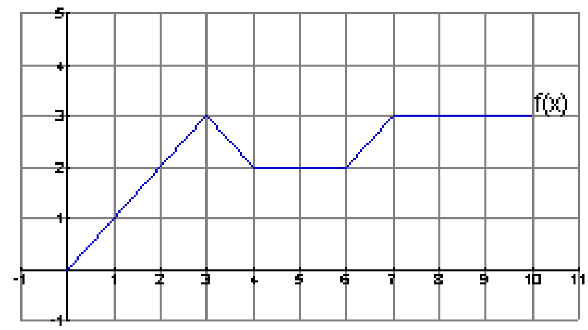
E. $\frac{d}{dx}\int_{6}^{x^2} cot(3t)\, dt =$

F. $\frac{d}{dx}\int_{7}^{5x} \frac{\sqrt{1+u^2}}{u}\, du =$

G. $\int_{x}^{6} \ln(1+t^2)\, dt =$

H. $\frac{d}{dx}\int_{x^3}^{5} \frac{cost}{t^2+2}\, dt =$

Example 2: Let $A(x) = \int_0^x f(t)dt$

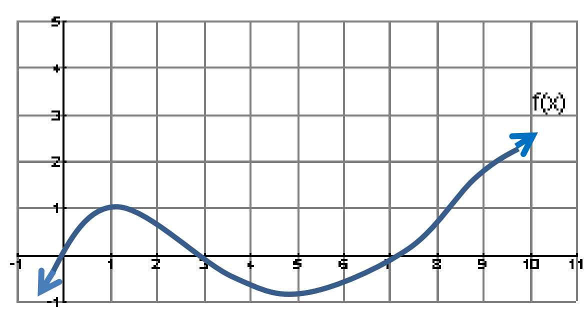


Calculate

A. $A(0)$
B. $A(4)$
C. $A(6)$
D. $A(10)$
E. $A'(4)$
F. $A'(8)$

Sketch A(x)

Example 3: Let $A(x) = \int_0^x f(t)dt$



A. State the intervals of increasing/decreasing for $A(x)$

B. Where does $A(x)$ have a local max/min?

C. Where does $A(x)$ have points of inflection?

D. State the intervals of concavity for $A(x)$.