

#39 Second Fundamental Theorem of Calculus 6.4

Let $F(x) = \int f(x) dx$ where $F'(x) = f(x)$.

1. Let $f(x) = x^3$. Then $F(x) = \int x^3 dx = \frac{1}{4}x^4 + C$.

What if $f(x)$ were some strange function that we couldn't antidifferentiate? We could still write

$$F(x) = \int f(x) dx$$

2. Let $y = \int_2^x t^3 dt$ where $f(t) = t^3$.

(a) Is this a function?

(b) What is the independent variable? Explain.

(c) Let $G(x) = \int_3^x t^3 dt$. Find $G(x)$. Is $G(x)$ in the same family as $F(x)$?

(d) Find $F'(x)$ and $G'(x)$.

(e)

CONCLUSION:

$$F(A) = \int_a^x f(t) dt \text{ then } F'(x) =$$

(f)

CONCLUSION:

$$F(A) = \int_a^a t^3 dt =$$

(g)

CONCLUSION:

$$\text{If } F(x) = \int_a^{g(x)} f(t) dt \text{ then } F'(x) =$$

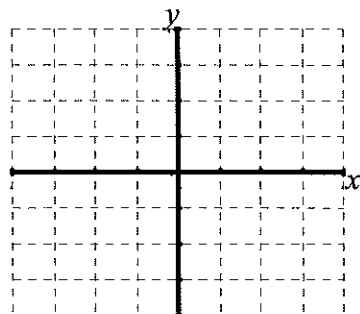
3. $E(x) = \int_0^x e^{-t^2} dt$ is an antiderivative of e^{-x^2} .

(a) Is $E(x)$ increasing or decreasing and why?

(b) Is $E(x)$ concave up or concave down and why?

(c) When are the values of $E(x)$ positive and when are they negative and why?

(d) Sketch a graph of $E(x)$.



4. Given the graph of $f(x)$ below, sketch a graph of $F(x) = \int_2^x f(t) dt$

In the grid below, change the $f(x)$ to $F(x)$.

