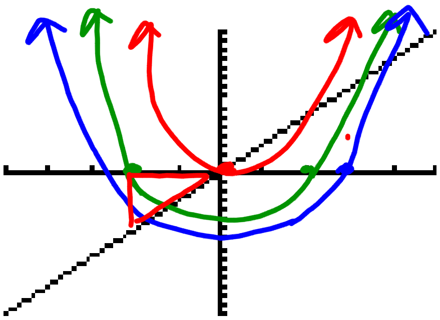
Opener

The average value of $f(x) = x^2\sqrt{x^3+1}$ on the closed interval $[0, 2]$ is

(A) $\frac{26}{9}$ (B) $\frac{13}{3}$ (C) $\frac{26}{3}$ (D) 13 (E) 26

Dec 11-7:09 PM



$\frac{1}{2}(2)(6)$

$$A(x) = \int_0^x 3t\,dt$$

$$A(x) = \int_{-2}^x 3t\,dt$$

$$A(x) = \int_3^x 3t\,dt$$

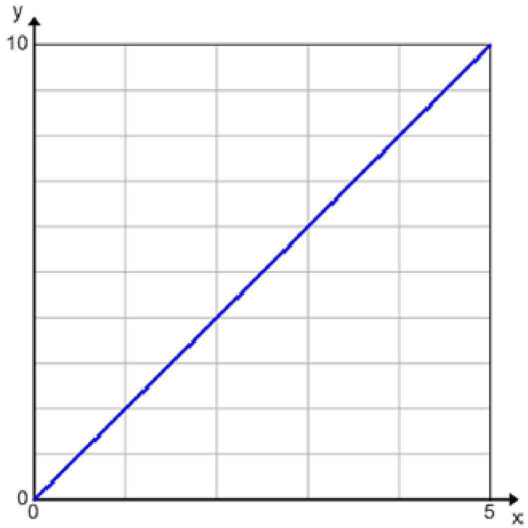
Nov 20-11:29 AM

5-4 day 2 The FUNdamental Theorem of Calculus

Learning Objectives:

I understand the connection between integral and differential calculus.

I can evaluate an integral using the Fundamental Theorem of Calculus Part 2.



$$g(x) = \int_{\boxed{0}}^{x} f(t)\,dt$$

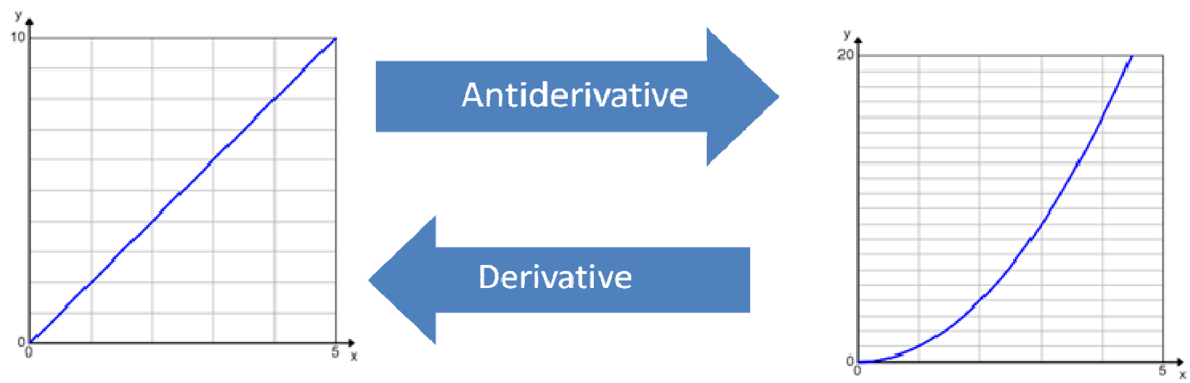
x	g(x)
0	0
1	1
2	4
3	9
4	16
5	25

$f(x) = 2x$

der

anti der

$g(x) = x^2$

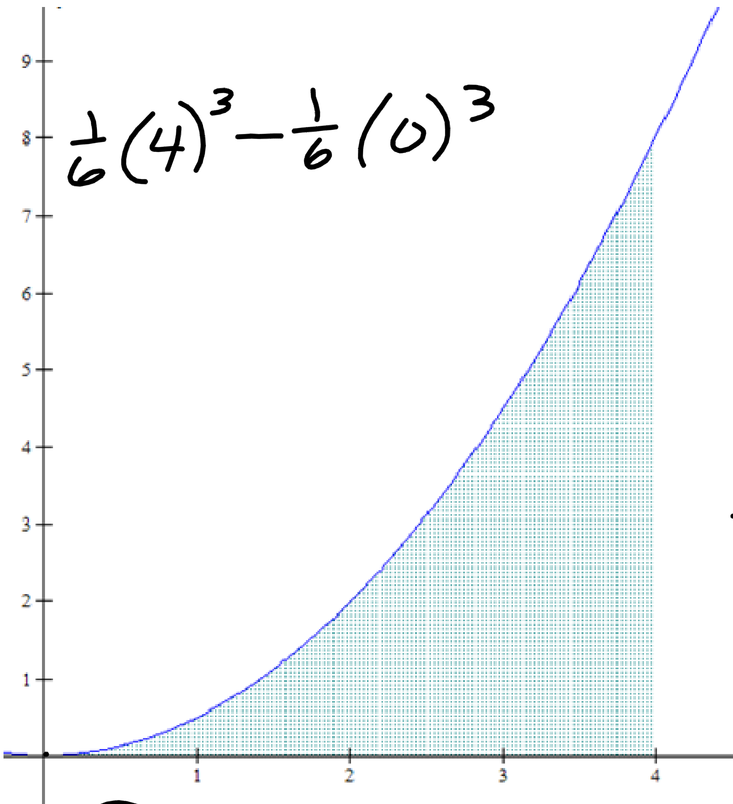


$f(t) = 2t$ $g(x) = x^2$

g(x) is the antiderivative of f(t)

Nov 19-8:08 AM

$$\frac{1}{6}(4)^3 - \frac{1}{6}(0)^3$$



$$y = \frac{1}{2}x^2$$

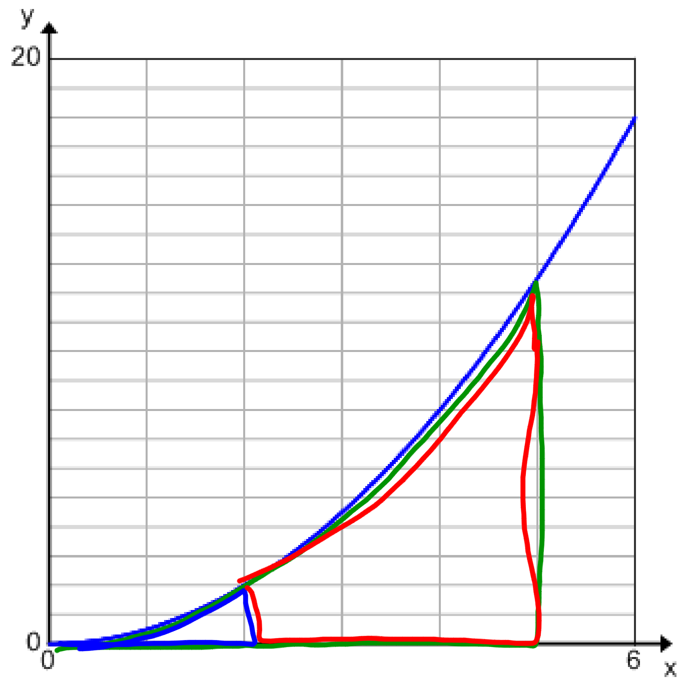
$$\int_0^4 \frac{1}{2}x^2\,dx$$

$$\frac{1}{6}x^3$$

$$\frac{1}{6}(4)^3$$

$$\frac{64}{6} = \frac{32}{3}$$

$$3x = \frac{1}{2}$$



$$y = \frac{1}{2}x^2$$

$$\int_2^5 \frac{1}{2}x^2\,dx$$

$\frac{1}{6}x^3$

$\frac{1}{6}(5)^3 = 125/6$

$-\frac{1}{6}(2)^3 = -8/6$

$117/6 = \boxed{39/2}$

The FUNdamental Theorem of Calculus Part 2

If f(x) is continuous at every point in [a,b] and if F(x) is the antiderivative of f(x) on [a,b], then

$$\int_a^b f(x)dx = F(b) - F(a)$$

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Ex1. Evaluate. Check your answer on the graphing calculator

1.) $\int_{-2}^{5} \left(x^2 + 3x + 1\right) dx$

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

1. $\int_{-2}^{5} (x^2+3x+1)\,dx$ $\quad F = \frac{x^3}{3} + \frac{3x^2}{2} + x$

$\frac{1}{3}x^3 + \frac{3}{2}x^2 + x \Big]_{-2}^{5}$

$F(5) - F(-2)$

$\overset{5}{\left(\frac{125}{3} + \frac{75}{2} + 5\right)} + \overset{-2}{\left(\frac{+8}{3} \mp 4\right)}$

$\boxed{= \frac{133}{3} + \frac{75}{2} + 1}$

$\frac{266}{6} + \frac{225}{6} + \frac{6}{6} = \boxed{\frac{497}{6}}$

2.) $\int_{1}^{4} \left(e^{2x}\right) dx$

$$\frac{1}{2} e^{2x} \Big|_{1}^{4}$$

$$\frac{1}{2} e^{(2\cdot 4)} - \frac{1}{2} e^{(2\cdot 1)}$$

$$\boxed{\frac{1}{2} e^{8} - \frac{1}{2} e^{2}}$$

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3.) $\int_0^{\pi} \sin x\,dx$

$F(x) = -\cos x \Big]_0^{\pi}$

$-\overset{-1}{\cos \pi} - (-\cos 0)$

$1 + 1 = 2$

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4.) $\int_{-1}^{3} \frac{dx}{x+5} = \int_{-1}^{3} \frac{1}{x+5}\, dx$

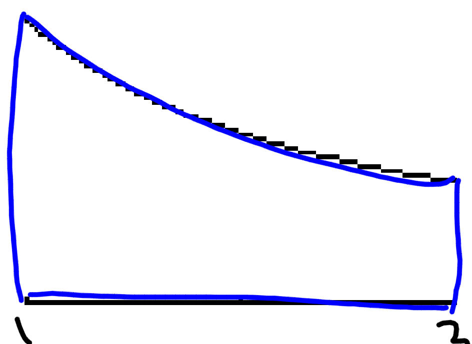
$= \ln|x+5| \Big|_{-1}^{3}$

$= \ln|3+5| - \ln|-1+5|$

$= \ln|8| - \ln|4|$

$= \ln 8 - \ln 4 = \ln\left(\frac{8}{4}\right) = \boxed{\ln 2}$

Ex2. Find the area between the curve $f(x) = \frac{1}{2x+1}$ and the x–axis bounded by $1 \leq x \leq 3$



$$\int_1^3 \frac{1}{2x+1}\,dx$$

$$\frac{1}{2} \cdot \ln|2x+1| \Big|_1^3$$

$$\frac{1}{2}\ln 7 - \frac{1}{2}\ln 3$$

$$\frac{1}{2}\ln\frac{7}{3}$$

$$\ln\left(\frac{7}{3}\right)^{1/2}$$

$$\ln\sqrt{\frac{7}{3}}$$

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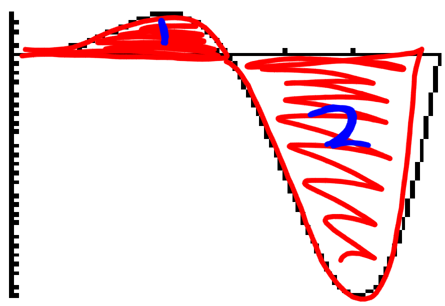
Ex3. Find the area between the curve

$f(x) = x^2 \sin x$ and the x–axis

bounded by $0 \leq x \leq 2\pi$



1. $\int_0^{\pi} x^2 \sin x \, dx = 5.8696$

2. $\int_{\pi}^{2\pi} x^2 \sin x \, dx = -45.3480$

$45.384 + 5.8696$

≈ 51.218

OR

$\int_0^{2\pi} |x^2 \sin x| \, dx$

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Plot1 Plot2 Plot3
\Y1=X²sin(X)
_Y2=|Y1|
\Y3=
\Y4=
\Y5=
\Y6=
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Homework

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