Warm-Up

What does the following limit mean?

$$\lim_{n\to\infty}\sum_{i=1}^{n}(5(c_i)^2-2c_i+7)\Delta x$$

h w

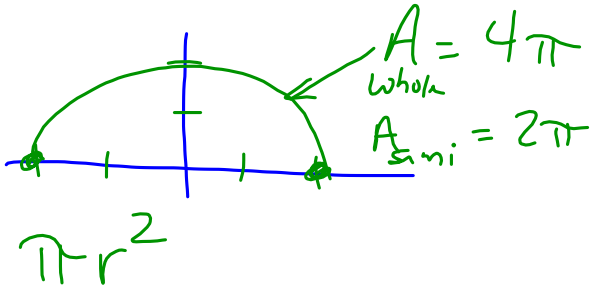
What is the equation for the curve you are finding the area under?

$5x^2 - 2x + 7$

5.2 Definite Integrals

Estimate the area under the graph $f(x)=\sqrt{4-x^2}$

using various rectangular methods with n = 10, 50, 100, 500



6.283
6.264
6.074

What happens as n approaches infinity? more accurate

definition of a definite integral as a limit of a Riemann Sum

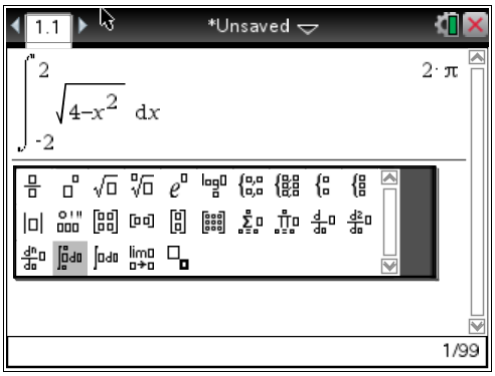
$$\lim_{n\to\infty}\sum_{i=1}^{n} f(x_i)\Delta x = \int_a^b f(x)\,dx$$

upper limit: b — definite integral

lower limit: a — integrand: $f(x)$ — variable of integration: dx

if a function is continuous on a given interval then the definite integral exists

$$\int_{-2}^{2}\sqrt{4-x^2}\,dx =$$



Ex. express the limit as a definite integral:

$$\lim_{n\to\infty}\sum_{i=1}^{n}(4(c_i)^3 - 3c_i + 2)\Delta x \qquad [1,6]$$

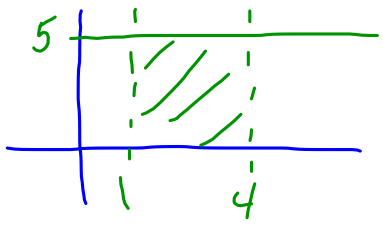
$$\int_1^6 (4x^3 - 3x + 2)\,dx$$

Definite Integrals on the Calculator

Nspire CAS/updated OS others

$\int_{\_}^{\_} \_\,dx$ NINT(function,variable,lower,upper)

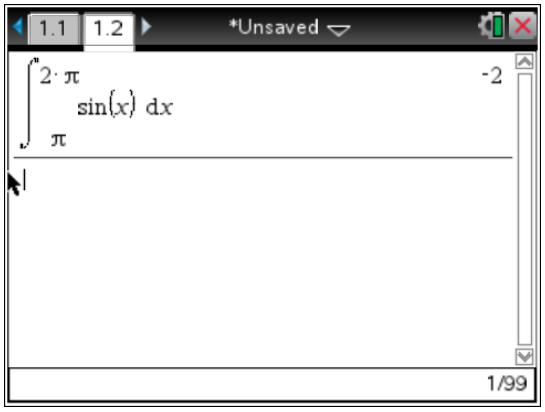
$\int_1^4 5\,dx =$ 15



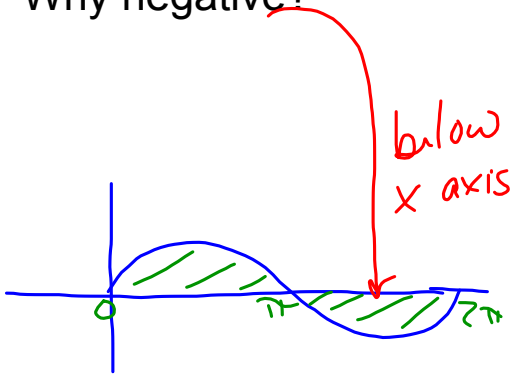
so $\int_a^b f(x)\,dx = \int_a^b c\,dx = c(b-a)$

$\int_{-2}^{6} 7\,dx =$ $7(6-(-2)) = 56$

Definite Integrals and Signed Area



Why negative?



net area vs. total area

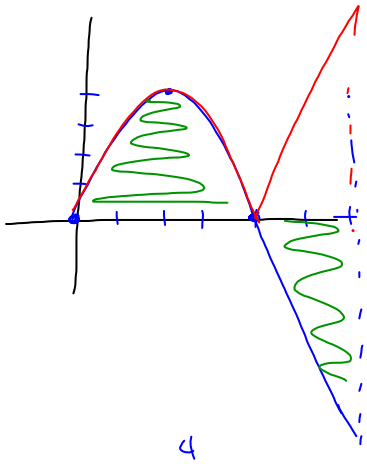
displacement

$\int_a^b f(x)dx =$ displacement net area

$\int_0^{2\pi} \sin x = 0$

Find the total area bounded by $y = 4x - x^2$ on [0,6]

$x(4-x)$



Calc.

$\int_0^6 |4x - x^2|\,dx$

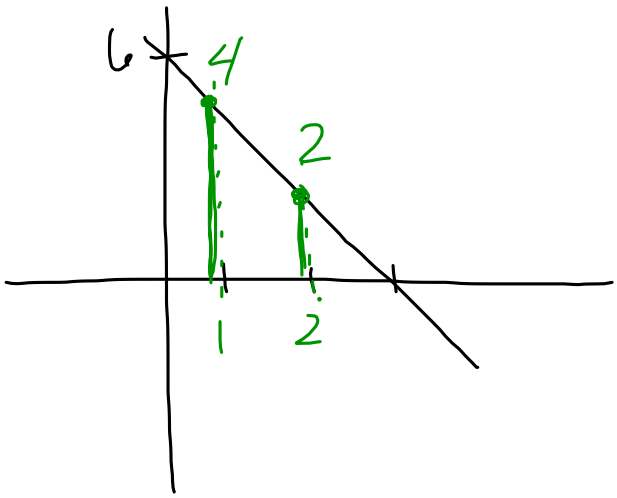
Total Dist. Area $= \int_0^4 (4x - x^2)\,dx + \left|\int_4^6 (4x - x^2)\,dx\right|$

$= 21.33$

$= \frac{64}{3}$

Use the graph of the integrand and areas to evaluate the integral.

$\int_1^2 (-2x+6)\,dx =$ 3



$\frac{h(b_1+b_2)}{2}$

$\frac{1(4+2)}{2} = 3$