Definite Integral Properties

If f(x) is continuous on [a,b] then...

1. $\int_a^a f(x)dx = 0$

2. $\int_b^a f(x)dx = -\int_a^b f(x)dx$

3. $\int_a^b kf(x)dx = k\int_a^b f(x)dx$

Definite Integral Properties - cont.

4. $\int_a^b \left(f(x) \pm g(x)\right)dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$

5. $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$

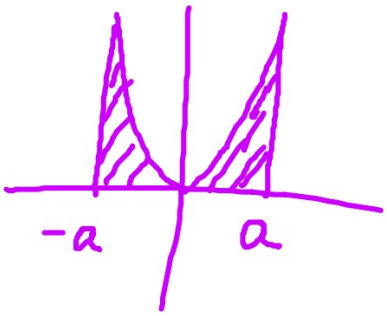
$a \le c \le b$

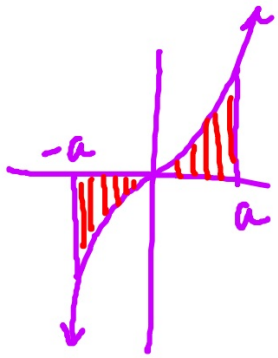
Definite Integral Properties - cont.

6. $\int_a^b \left(f(x)+c\right)dx = \int_a^b f(x)\,dx + \int_a^b c\,dx$

Definite Integral Properties - cont.

8. If f(x) is even, $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$





9. If f(x) is odd, $\int_{-a}^{a} f(x)dx = 0$

ex: If f(x) is continuous and

$$\int_0^1 f(x)dx = -4 \qquad \int_0^3 f(x)dx = 6 \qquad \int_3^5 f(x)dx = -7$$

use the properties of integrals to evaluate.

a) $\int_3^0 f(x)dx = -6$

ex: If f(x) is continuous and

$$\int_0^1 f(x)dx = -4 \qquad \int_0^3 f(x)dx = 6 \qquad \int_3^5 f(x)dx = -7$$

use the properties of integrals to evaluate.

b) $\int_3^5 (f(x)+6)dx = \int_3^5 f(x)dx + \int_3^5 6dx$

$-7 + 12$

5

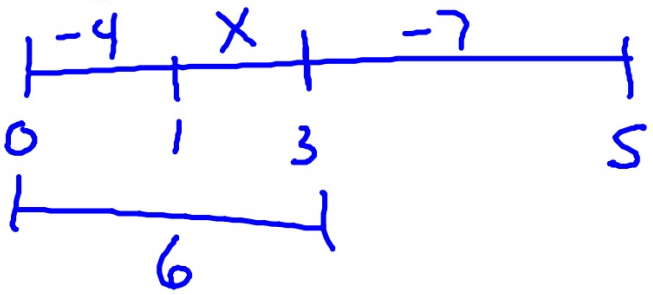
ex: If f(x) is continuous and

$$\int_0^1 f(x)dx = -4 \qquad \int_0^3 f(x)dx = 6 \qquad \int_3^5 f(x)dx = -7$$

use the properties of integrals to evaluate.

c) $\int_0^5 f(x)dx = -1$

$$\int_1^3 f(x)dx = 10$$



ex: If f(x) is continuous and

$$\int_0^1 f(x)dx = -4 \qquad \int_0^3 f(x)dx = 6 \qquad \int_3^5 f(x)dx = -7$$

use the properties of integrals to evaluate.

e) $\int_0^1 3f(x)dx = -12$

ex: Evaluate.

$$\int_{-13}^{13} \sin x dx = 0$$

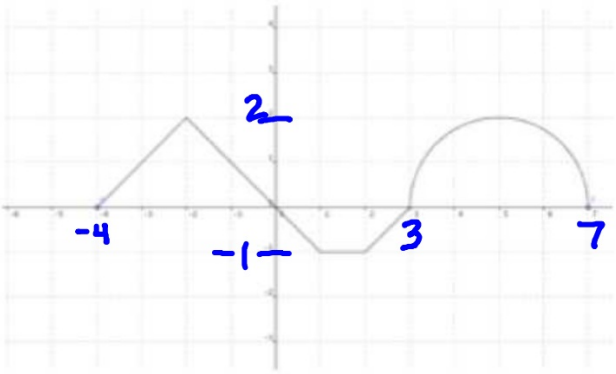
odd

$$\int_{-a}^{a} f(x)dx = 0$$

ex: If f(x) is even and $\int_{0}^{20} f(x)dx = -7$ then

$$\int_{-20}^{20} f(x)dx = -14$$

ex: The graph below represents the function, $f(x)$.



Evaluate.

1. $\int_3^7 f(x)dx$ $= 2\pi$

   $\frac{1}{2}\pi(2)^2$

2. $\int_{-4}^0 f(x)dx$ $= 4$

   $\frac{1}{2}(4)(2)$

3. $\int_{-4}^7 f(x)dx$

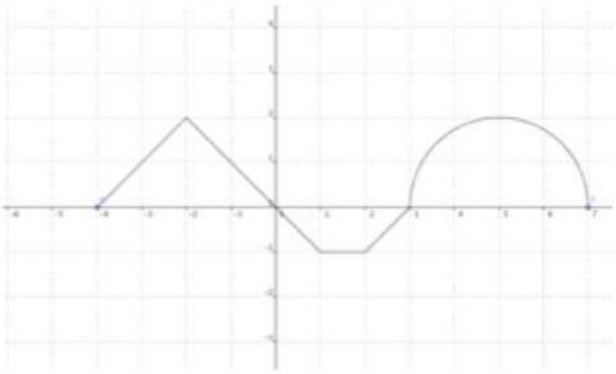
   $4 - 2 + 2\pi = 2 + 2\pi$

4. $\int_3^0 f(x)dx = -\int_0^3 f(x)dx$

   $-(-2) = 2$

*See printout.

$\int_{-4}^{0} f(x)dx + \int_{-4}^{0} 1\,dx$



5. $\int_{-4}^{0} [f(x)+1]dx$

$4+4 = 8$

6. $-\int_{3}^{7} -f(x)dx = -2\pi$

7. $\int_{-4}^{7} |f(x)|dx = 6+2\pi$

$4+2+2\pi$

8. $\int_{3}^{-4} 5f(x)dx$

- Total Distance (by calculator)

ex: A particles moves on the x-axis so that its position at any time is given by: $x(t) = 4t^3 - 18t^2 + 15t - 1$

Find the total distance traveled by the particle from t=0 to t=3.