LESSON MAKER PRO

Area Under Curves

Use definite integrals to find area.

HIGH SCHOOL · C.S.27

C.S.27 "Apply integration to solve problems of area."

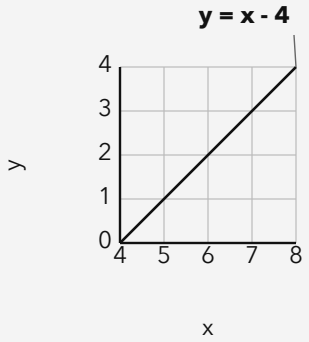
NAME _____ DATE _____

THE AREA RULE

When y=f(x) stays on or above the x-axis from x=a to x=b, the area beneath it is the integral of f(x) from a to b. Find an antiderivative F(x), then subtract F(a) from F(b).

WORKED EXAMPLE

Find the area under y=x-4 from x=5 to x=7.



1. An antiderivative is $F(x)=x^2/2-4x$.
2. F(7)-F(5)=(49/2-28)-(25/2-20).
3. Simplify: -7/2-(-15/2)=4.

Answer: 4 square units

PRACTICE 4 problems

1 Find the area under y=3x from x=0 to x=2.

ANSWER _____

2 Find the area under $y=x^2$ from x=0 to x=3.

ANSWER _____

3 Find the area under y=8-x from x=1 to x=3.

ANSWER _____

4 Find the area under $y=x^2-x$ from x=1 to x=3.

ANSWER _____

APPLY IT Show your work

1 A school mural reaches height $h(x)=x+1$ meters at horizontal position x meters, from x=0 to x=3. The painted region extends from the floor to the top edge. Find its area.

WORK SPACE

ANSWER _____

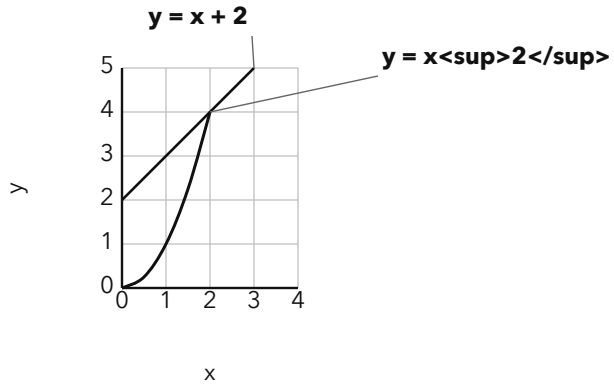
2 A gaming backdrop reaches height $h(x)=6-x^2$ feet at horizontal position x feet, from x=0 to x=2. It extends from the floor to this curved top edge. Find its front area.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find the area between the curves from x=0 to x=2. Show the integral you use.



WORK SPACE AND ANSWER

ANSWER KEY

Area Under Curves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the area under $y=3x$ from $x=0$ to $x=2$.	**6 square units**
2	Find the area under $y=x^2$ from $x=0$ to $x=3$.	**9 square units**
3	Find the area under $y=8-x$ from $x=1$ to $x=3$.	**12 square units**
4	Find the area under $y=x^2-x$ from $x=1$ to $x=3$.	**14/3 square units**

PART 2 · APPLY IT

1. **15/2 square meters** Integrate $x+1$ from 0 to 3: $[x^2/2+x]$ from 0 to 3 equals 15/2.
2. **28/3 square feet** Integrate $6-x^2$ from 0 to 2: $[6x-x^3/3]$ from 0 to 2 equals 28/3.

CHALLENGE

The integral of $(x+2-x^2)$ from 0 to 2 is 10/3 square units.

Accept equivalent exact fractions. In the challenge, the integral must subtract the lower curve from the upper curve.