LESSON MAKER PRO

Integral Finish Line

Use antiderivatives to find exact accumulated change.

HIGH SCHOOL · MA.912.C.4.4

MA.912.C.4.4 "Evaluate definite integrals by using the Fundamental Theorem of Calculus."

NAME _____ DATE _____

THE BIG IDEA

To evaluate ∫ from a to b of f(x) dx, find an antiderivative F(x) such that F'(x)=f(x). Then calculate F(b)-F(a), subtracting the value at the lower limit.

WORKED EXAMPLE

Evaluate ∫ from 11 to 17 of x dx.

1. An antiderivative is $F(x)=x^2/2$.
2. $F(17)=289/2$ and $F(11)=121/2$.
3. $F(17)-F(11)=289/2-121/2=84$.

Answer: 84

PRACTICE 6 problems

1 Evaluate ∫ from 0 to 3 of x^2 dx.

ANSWER _____

2 Evaluate ∫ from -3 to 3 of x^3 dx.

ANSWER _____

3 Evaluate ∫ from 2 to 5 of (4x-3) dx.

ANSWER _____

4 Evaluate ∫ from -4 to 0 of (x+5) dx.

ANSWER _____

5 Evaluate ∫ from 1 to 4 of $3x^2$ dx.

ANSWER _____

6 Evaluate ∫ from 0 to pi of sin(x) dx.

ANSWER _____

APPLY IT Show your work

1 An e-bike's velocity is v(t)=3t+2 meters per minute, where t is time in minutes. How far does the e-bike travel from t=0 to t=4?

WORK SPACE

ANSWER _____

2 During a gaming tournament, spectators enter at a rate of r(t)=4t+1 spectators per minute, where t is minutes after the doors open. How many spectators enter from t=1 to t=3?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Evaluate ∫ from -4 to 6 of |x| dx. Explain your reasoning by splitting the integral where the expression inside the absolute value changes sign.

WORK SPACE AND ANSWER

ANSWER KEY

Integral Finish Line

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Evaluate ∫ from 0 to 3 of x^2 dx.	**9**
2	Evaluate ∫ from -3 to 3 of x^3 dx.	**0**
3	Evaluate ∫ from 2 to 5 of (4x-3) dx.	**33**
4	Evaluate ∫ from -4 to 0 of (x+5) dx.	**12**
5	Evaluate ∫ from 1 to 4 of $3x^2$ dx.	**63**
6	Evaluate ∫ from 0 to pi of sin(x) dx.	**2**

PART 2 · APPLY IT

1. **32 meters** Evaluate ∫ from 0 to 4 of (3t+2) dt. An antiderivative is $(3/2)t^2+2t$, and its value from 0 to 4 is 32.
2. **18 spectators** Evaluate ∫ from 1 to 3 of (4t+1) dt. Using $2t^2+t$ gives 21-3=18.

CHALLENGE

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Accept equivalent exact forms and correct use of F(b)-F(a). For the challenge, accept a correct split at x=0 with an accurate explanation of why |x|=-x for negative x and |x|=x for positive x.