

## 12.1 IB Math - Unit 5: Integration

Bronx Early College Academy

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5.1 Drui: Antiderivatives. Friday 4 January

5.2 Drui: Indefinite Integral. Monday 7 January

5.3 Drui: Deltamath Integration Tuesday 8 January

5.4 Drui: Boundary conditions. Wednesday 9 January

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## GQ: How do we find the antiderivative of a function?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

5.1 Friday 4

January

Do Now. Find  $\frac{dy}{dx}$

1. Given  $y = x^3 + x^2 + 17$ .
2. Given  $y = \frac{1}{4}x^4 + \frac{1}{2}x^2 + 9 - \frac{1}{x}$ .
3. If  $\frac{dy}{dx} = 3x^2 + x$ , find  $y$ .
4. Skills check #1 p. 290

Problem sets from January 2,3; Sigma notation, p 290

Lesson: Antiderivatives pp. 291-2

Exam review

Homework: Exercises 9A p. 293; test corrections due Monday

## GQ: How do we find the indefinite integral of a function?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function 5.2 Monday 7 January

Do Now. Find the antiderivative,  $F(x)$ , of each function,  $f(x)$ , such that  $F'(x) = f(x)$

1.  $f(x) = 4x^3 + 3x^2 + 1.$
2.  $f(x) = x^4 + x^2 + 5.$
3.  $f(x) = \sqrt{x}$

Test corrections due, review. (take home test tomorrow)

Lesson: Indefinite integral pp. 293-4

Homework: Exercises 9B p. 294

## GQ: How do we integrate functions?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

5.3 Tuesday 8

January

Do Now. Handout-test review

Deltamath Integration practice (taking antiderivatives)

Homework: Take home test, due tomorrow (from Dec 13)

## GQ: How do we apply boundary conditions to an integral?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function 5.4 Wednesday 9 January

Do Now. Find each indefinite integral.

1.  $\int (3x^2 + 2x + 1) dx.$

2.  $\int (x^4 + 6x^2 + 1) dx.$

3.  $\int \sqrt{x} dx.$

4.  $\int \frac{\pi}{4} \sqrt[3]{x^2} dx$

5.  $\int x^{-1} dx$

Lesson: Finding the constant  $C$  given boundary conditions. pp. 295-6

Homework: Exercises 9C p. 296-7

## GQ: How do we calculate area with integration?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

### Do Now

1. Find  $\int (4x^3 - 3x + 1)dx$ .
2. Find  $\int e^{5x}dx$ .
3. Find  $\int \frac{1}{3x+1}dx$ .

Homework review #1, 5, 6 p. 302

Lesson: Reimann sums and the definite integral

Task: Example 8, page 304

Assessment: Calculator integration

Homework: Exercises 9H evens p. 308

## GQ: How do we calculate area with definite integrals?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

### Do Now

1. Use a calculator to find  $\int_0^{\frac{\pi}{2}} \cos x \, dx$
2. Differentiate  $y = \sqrt{3x^3 - x}$
3. Find  $\int (6x^2 - 2x - 5)dx$ .
4. Differentiate  $y = (3x^2 - 5x)^5$
5. Find  $\int 5(x^2 + 1)^4(2x)dx$ .
6. Find  $\int \frac{3}{x} \, dx$ .

Lesson: Properties of definite integrals p. 307

Task: Review homework problems

Assessment: Problem #11 p. 300

Homework: Exercises 9H evens p. 308



## GQ: How do we calculate area with definite integrals?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

### Do Now

1. Use a calculator to find  $\int_{-1}^1 \frac{1}{x+2} dx$
2. Differentiate  $y = \sqrt[3]{5x^2 - 2x}$
3. Find  $\int (6x^2 - 2)^4(12x) dx$ .
4. Differentiate  $y = (3x^2 - 5x)(\ln x)$
5. Find  $\int_1^2 \frac{3}{x^2} dx$ . (check your result with a calculator)

Lesson: The fundamental theorem of calculus p. 309

Task: Practice Examples 11, 12 p. 310-1

Assessment: Problem 9J #1 p. 312

Homework: Exercises 9I, 9J p. 310-12

## GQ: How do we calculate the area between two curves?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

Do Now: Consider the function  $f(x) = -x^2 + 2x + 3$

1. Factor  $f$  and state its zeros.
2. Restate  $f$  in vertex form. Write down the vertex as an ordered pair.
3. Differentiate  $f$ . Show that the zero of  $f'(x)$  is the vertex of  $f$ .
4. If  $f(x)$  represents the height of a diver over the domain  $0 \leq x \leq 3$ , interpret  $f(0)$  and  $f'(0)$
5. What is the size of the area bounded by  $f$ ,  $x = 0$ , and  $y = 0$ ?

Lesson: The area between two functions p. 313

Assessment: Example #13 p. 314

Homework: Exercises 9K p. 316

## GQ: How do we calculate a volume of rotation?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function

Do Now: Sketch the functions  $f(x) = 10x + x^2 - 3x^3$  and  $g(x) = x^2 - 2x$

1. What are their intersections? (i.e.  $f(x) = g(x)$ )
2. What is the definite integral representing the area between the curves?
3. Using a calculator, what is the size of the area? (this may not be a trivial question)

Lesson: Integrating circle areas, modeling a solid p. 318

Assessment: Example #15 p. 319

Homework: Exercises 9L & 9M p. 317, 319; probability handout

## GQ: How do we calculate displacement from velocity?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function 12.1

Do Now: Do the calculations below and read the handout

1. Lance Armstrong's average speed in his six Tour de France victories from 1999-2004 was about 24 miles per hour. Assuming that he pedals at his average speed and takes no breaks, how long would it take him to ride 38 miles to the top of a 10,000 ft. volcano?
2. People who are not Lance Armstrong can travel at about 12 miles per hour on a bike. At that speed, how long would it take to reach the top of the volcano?

Lesson: Integrating velocity over time, displacement p. 321

Assessment: Example #18 p. 323

Homework: Exercises 9N & 9O p. 320, 324

## GQ: How do we calculate displacement from velocity?

CCSS: F.IF.B.6 Calculate & interpret the rate of change of a function 12.1

Do Now: continued, 38 mile ride in 10 hours

1. Using the velocity vs time graph from yesterday, integrate to show that the areas representing the distance covered by the three riders are equal ( $v \times t = d$ ).
2. Show that a rider accelerating according to  $v(t) = \frac{76}{100}t$  also arrives at (10, 38).

Lesson: Integrating velocity over time, displacement p. 321

Task: Review 9F, 9M, probability

Assessment: Example #18 p. 323 (take home test Thursday)

Homework: Exercises 9P p. 326, any remaining problem sets

## GQ: How do we integrate a function?

CCSS: HSF.IF.B.6 Calculate and interpret the area under a function

12.1

Do Now: Chain rule - Take the derivative of each function

1.  $f(x) = \sin x^3$
2.  $g(x) = \sqrt{x^4 + 2}$
3.  $h(x) = \ln(x^2 + 1)$

Lesson: Take home exam papers assessment & review

Task: Work problems on board

Assessment: Test corrections due

Homework: Integration exam problems

## GQ: How do we calculate volume (of a rotated function)?

CCSS: HSF.IF.B.6 Calculate and interpret the area under a function 12.1

Do Now: Identifying problem types. On your homework, underline the “M1” points you earned. Examples:

1.  $X \sim B(10, 0.5)$
2. bell curve sketch
3.  $u = \& \quad u' =$

Lesson:  $\int_a^b \pi r^2 dx$

Task: Work homework problems on board

Assessment: self-reflection on mixed versus block problem sets

Homework: Solids of rotation & mixed exam problems

## The volume of a function rotated around the x-axis

Differentiate over  $x$ , but use the area of a disk defined by  $A = \pi r^2$

video

