8.2 The 1st Fundamental Theorem of Calculus

NOTES

CALCULUS

Write your questions here!

Antiderivatives

$v(t) = t^2 - 6t + 2$

Find the antiderivative

$f'(x) = 2x^3 - 5x + 7$

$f'(x) = x^4 - 3x^3 + 5x^2 - x + 5$

$f'(x) = \sqrt{x} - 4$

Basic Rule for Integration

$$\int x^n \, dx$$

Indefinite Integral

$$\int f(x)dx$$

Evaluate the indefinite integral

$\int (9 - x^2)dx$

$\int \left(\frac{6}{x^2} - x^{-3}\right)dx$

$\int \left(\frac{2x^3 - 4x^2 + 7x}{x}\right)dx$

The First Fundamental Theorem of Calculus

If a function *f* is continuous on the closed interval [a, b] and *F* is an antiderivative of *f* on the interval [a, b], then

$$\int_a^b f(x)dx = F(b) - F(a)$$

Evaluate the definite integral

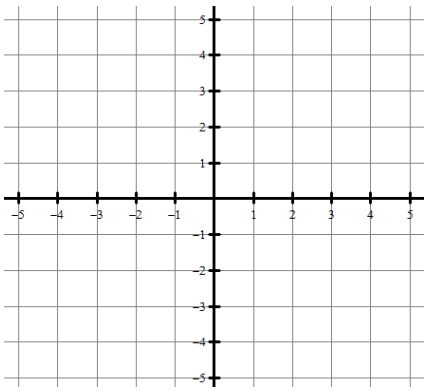
$\int_2^6 (3x^2 + x - 2)dx$

Evaluate the definite integral

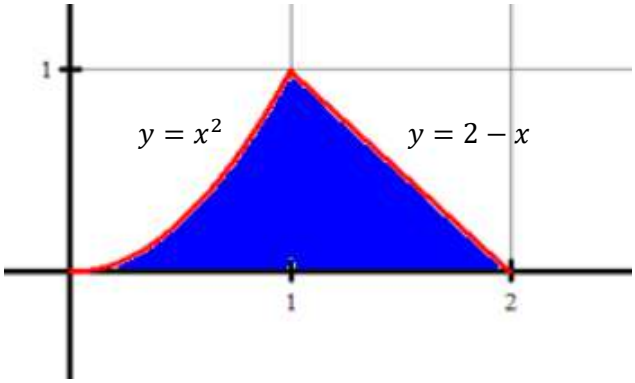
$$\int_{-2}^{5}(4-6x)dx$$

Evaluate the definite integral

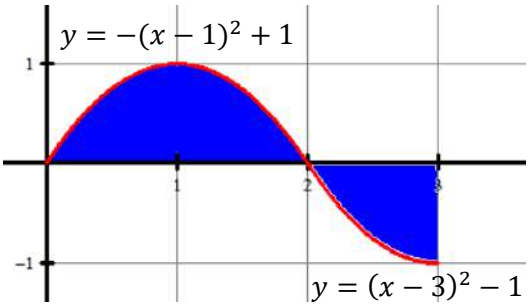
$$\int_{0}^{3}|x-2|dx$$



Find the area under the curve for the interval $[0,2]$



Set up the integral(s) to find the area of the shaded region. Do NOT solve!



SUMMARY:

Now, summarize your notes here!

8.2 The 1st Fundamental Theorem of Calculus

PRACTICE

Find the antiderivatives of the following.

1. $f'(x) = 9x^2 - 5x + 2$

2. $f'(x) = \frac{x^4 - 4x^3 + 7x}{x}$

3. $f'(x) = 2\sqrt{x} + 3$

Evaluate the indefinite integrals.

4. $\int (3x + \pi)\, dx$

5. $\int \left(x^{-3} + \frac{9}{x^2}\right) dx$

6. $\int (5 - 6x^2)\, dx$

Evaluate the definite integrals using the Fundamental Theorem of Calculus.

7. $\int_0^4 (2x + 4) dx$

8. $\int_{-1}^3 (6x^2 - 8) dx$

9. $\int_4^9 \sqrt{x}\, dx$

10. $\int_4^2 \left(\frac{x^2 - 1}{x^2}\right) dx$

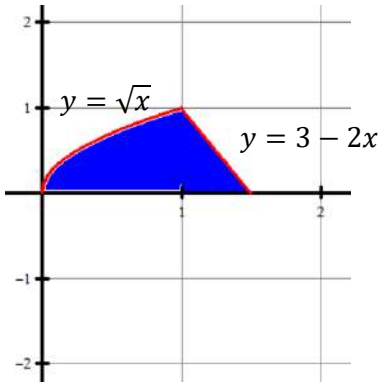
Evaluate the definite integrals using the Fundamental Theorem of Calculus.

11. $\int_{-5}^{0} |x+3|dx$

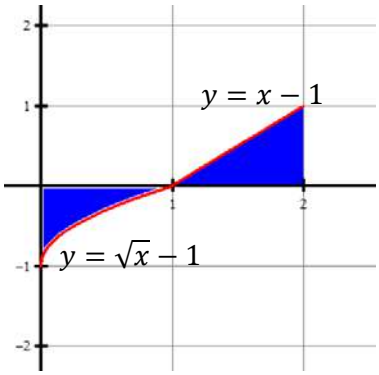
12. $\int_{-4}^{-1} \left(\frac{3}{x^2}+1\right)dx$

Find the area of the shaded region.

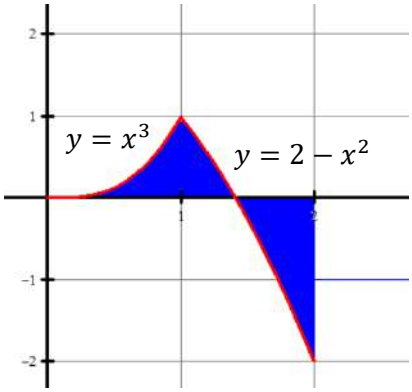
13.



14.



15.



MULTIPLE CHOICE

Use the table below for questions 1-2

x	0	1	2	3
$f(x)$	-1	0	1	-2
$F(x)$	4	3	A	8

1. What is $\int_1^3 f(x)\,dx$?
   (A) 5
   (B) 8
   (C) -2
   (D) 19
   (E) Cannot be determined from the information given

2. If the area under the curve $f(x)$ on the interval $0 \le x \le 2$ is equal to the area under the curve $f(x)$ on the interval $2 \le x \le 3$, then $A =$
   (A) 4
   (B) 5
   (C) 5.5
   (D) 6
   (E) 7

3. The function *f*, continuous for all real numbers *x*, has the following properties:

   I. $\int_1^3 f(x)dx = 7$

   II. $\int_1^5 f(x)dx = 10$

   What is the value of *k* if $\int_3^5 kf(x)dx = 33$?
   (A) -11
   (B) -3
   (C) 0
   (D) 3
   (E) 11

4. What is the *y*-intercept of the line that is tangent to the curve $f(x) = \sqrt{2x-3}$ at the point on the curve where $x = 6$?
   (A) 0
   (B) $\frac{1}{3}$
   (C) $\frac{2}{3}$
   (D) 1
   (E) $\frac{4}{5}$

FREE RESPONSE

Your score:___ out of 7

1. A particle moves along the *y*-axis with velocity $v(t) = -\frac{2}{\pi}\sin\left(\frac{\pi}{2}t\right)\ \ cm/sec$ for $t \geq 0$ in seconds.

(a) In what direction is the particle moving at $t = \frac{1}{3}$? Justify.

(b) Find the earliest time, $t_1 > 0$, when the particle changes direction.

(c) What is the particle's average acceleration over the interval $[0, t_1]$?

(d) Does the concavity of the position function, $s(t)$, change sign over the interval $[0, t_1]$?