

## 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

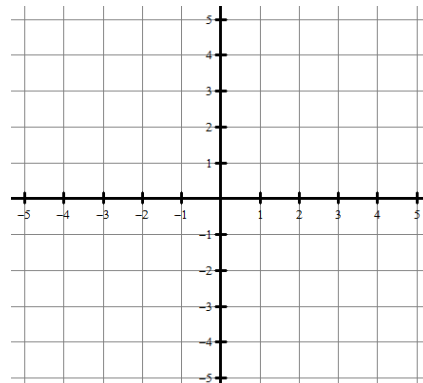
$$\int_2^6 (3x^2 + x - 2) dx$$

Evaluate the definite integral

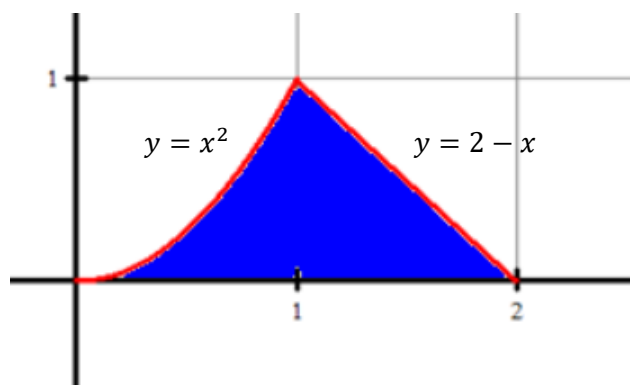
$$\int_{-2}^5 (4 - 6x) dx$$

Evaluate the definite integral

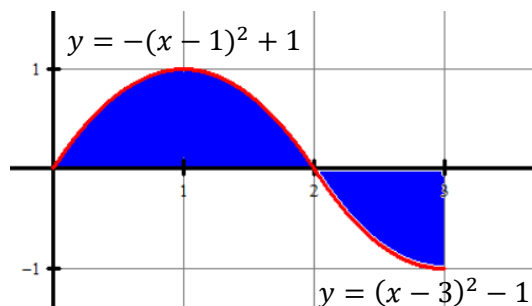
$$\int_0^3 |x - 2| dx$$



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!



**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.

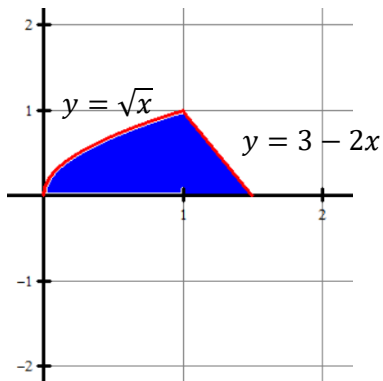
$$\int_{-5}^0 |x + 3| dx$$

12.

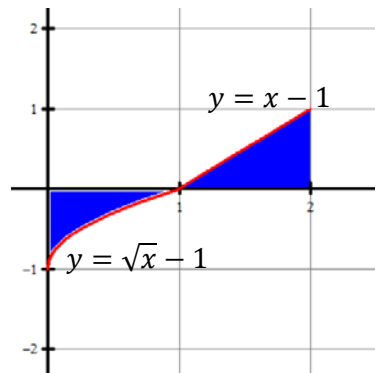
$$\int_{-4}^{-1} \left( \frac{3}{x^2} + 1 \right) dx$$

Find the area of the shaded region.

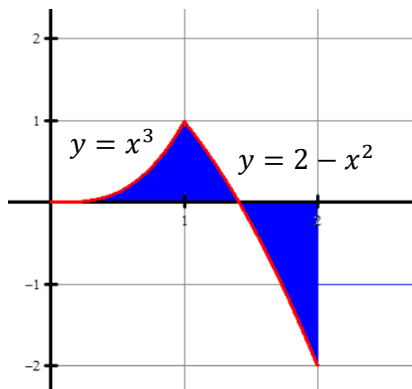
13.



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  $0 \leq x \leq 2$  is equal to the area under the curve  $f(x)$  on the interval  $2 \leq x \leq 3$ , 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  $[0, t_1]$ ?