Table 5.3 Rules for Definite Integrals		
1. Order of Integration:	$\int_{b}^{a} f(x) dx = -\int_{a}^{b} f(x) dx$	A definition
2. Zero:	$\int_{a}^{a} f(x) dx = 0$	Also a definition
3. Constant Multiple:	$\int_{a}^{b} kf(x) dx = k \int_{a}^{b} f(x) dx$	Any number k
	$\int_{a}^{b} -f(x) dx = -\int_{a}^{b} f(x) dx$	<i>k</i> = -1
4. Sum and Difference:	$\int_{a}^{b} (f(x) \pm g(x)) dx = \int_{a}^{b} f(x)$	$dx \pm \int_{a}^{b} g(x) dx$
5. Additivity:	$\int_{a}^{b} f(x) dx + \int_{b}^{c} f(x) dx = \int_{a}^{c}$	f(x) dx

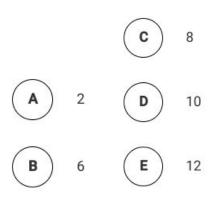
1. Suppose that f and g are continuous functions and that

$$\int_{1}^{2} f(x)dx = -4, \qquad \int_{1}^{5} f(x)dx = 6, \qquad \int_{1}^{5} g(x)dx = 8$$

Find each integral below:

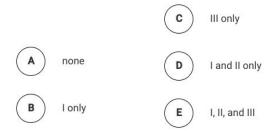
- a. $\int_{2}^{2} g(x)dx$ b. $\int_{5}^{1} g(x)dx$ c. $\int_{1}^{2} 3f(x)dx$ d. $\int_{2}^{5} f(x)dx$ e. $\int_{1}^{5} [f(x) - g(x)]dx$ f. $\int_{1}^{5} [4f(x) - g(x)]dx$
- 2. The function *f* is defined by $\int_{1}^{5} f(x) dx?$

$$f\left(x
ight)=\left\{egin{array}{cc} 2 & ext{for } x<3\ x-1 & ext{for } x\geq 3. \end{array}
ight.$$
 What is the value of



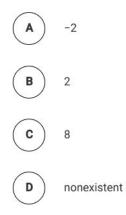
- 3. Let *f* and *g* have continuous first and second derivatives everywhere. If $f(x) \le g(x)$ for all real *x*, which of the following must be true?
 - I. $f'(x) \le g'(x)$ for all real x.
 - II. $f''(x) \le g''(x)$ for all real x.

III.
$$\int_{0}^{1} f(x) dx \leq \int_{0}^{1} g(x) dx$$



4. The function *f* is defined as

$$f(x) = \begin{cases} \frac{|x|}{x} & \text{for } x \neq 0\\ 0 & \text{for } x = 0 \end{cases}$$
 The value $\int_{-5}^{3} 5f(x)dx$ is:



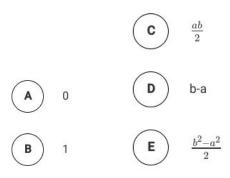
5. Interpret the integrand as the rate of change of a quantity and evaluate the integral using the antiderivative of the quantity:

a.
$$\int_{0}^{\frac{\pi}{2}} \cos x \, dx$$
 b. $\int_{0}^{\frac{\pi}{4}} \sec^2 x \, dx$ c. $\int_{0}^{\frac{1}{2}} \frac{1}{\sqrt{1-x^2}} dx$

AB Calculus 6.3 Definite Integrals and Antiderivative

d.
$$\int_{-1}^{2} 3x^2 dx$$
 e. $\int_{3}^{7} 8 dx$ f. $\int_{1}^{4} -x^{-2} dx$

5. If *f* is a linear function and 0 < a < b, then $\int_{a}^{b} f''(x) dx =$



DEFINITION Average (Mean) Value

If f is integrable on [a, b], its **average (mean) value** on [a, b] is

$$av(f) = \frac{1}{b-a} \int_a^b f(x) \, dx.$$

6. Find the average value of the function on the interval, using antiderivatives to compute the integral.

a.
$$y = \frac{1}{x}$$
, $[e, 2e]$
b. $y = \frac{1}{1+x^2}$, $[0, 1]$
c. $y = \sec x \tan x$,
 $[0, \frac{\pi}{3}]$