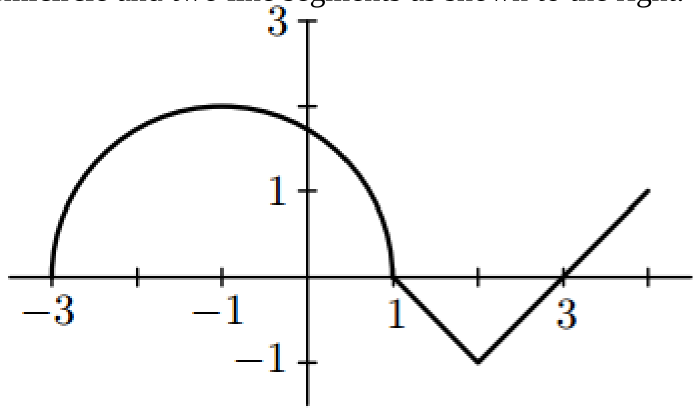
AP Calculus - Basic Integration Practice Problems - Calculator Inactive

Name:________________________________

(1) $\int_0^1 x\sqrt{ax^2+b}\,dx$, where a and b are constants.

For Questions 2-4, the graph of a function *f* consists of a semicircle and two line segments as shown to the right. Let $g(x) = \int_1^x f(t)dt$.



(2) Find $g(3)$.

(3) Find $g(-1)$.

(4) Write an equation for the line tangent to the graph of *g* at *x* = -1.

(5) The rate of water flow, in gallons per hour, can be modeled by $R(t) = \frac{1}{2}\left(10 + 6t - \frac{1}{4}t^2\right)$. Find the average water flow over the first 6 hours. Indicate units of measure.

(6) Using the substitution $u = \sqrt{x}$, $\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}}dx$ is equal to which of the following?

(A) $2\int_1^{16} e^u du$ (B) $2\int_1^4 e^u du$ (C) $2\int_1^2 e^u du$

(D) $\frac{1}{2}\int_1^2 e^u du$ (E) $\int_1^4 e^u du$

(7) $\frac{d}{dx}\left(\int_{x^4}^{\sin 2x} \sqrt{x}dx\right) =$

(8) The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function *R* of time *t*. The table below shows the rate as measured every 3 hours for a 24-hour period.

t (hours)	0	3	6	9	12	15	18	21	24
R(t) (gal/hr)	2	3	5	6	6	8	10	11	14

Use a midpoint Riemann sum with 4 subdivisions of equal length to approximate the value of $\int_0^{24} R(t)dt$. Using correct units, explain the meaning of your answer in terms of water flow.

(9) $\int_{\pi/6}^{\pi/2} \cot x \, dx =$

(A) $\ln\frac{1}{2}$ (B) $\frac{1}{2}$ (C) $-\ln\frac{1}{2}$ (D) $\ln\left(\sqrt{3}-1\right)$ (E) None of these

(10) If f'(x) is positive and f''(x) is negative, which approximation is an underestimation?

I. Left RAM

II. Right RAM

III. Trapezoidal Rule

I only B. II only C. III. only D. I and III E. II and III

(11) $\int_0^1 \frac{e^x}{(3-e^x)^2} dx =$

(A) $3\ln|e-3|$ (B) 1 (C) $\frac{1}{3-e}$ (D) $\frac{e-1}{2(3-e)}$ (E) $\frac{e-2}{3-e}$

(12) The acceleration of a particle moving along a straight line is given by $a = 6t$. If, when $t = 0$ its velocity is $v = 1$ and its distance $s = 3$, then determine the position function for any time t.

(13) $\int \frac{2y+3}{\sqrt{y-5}} dy =$

(14) If $\int_a^b f(x)dx = 3$ and $\int_a^b g(x)dx = -2$, then which of the following must be true?

I. $f(x) > g(x)$ for all $a \leq x \leq b$

II. $\int_a^b [f(x) + g(x)]dx = 1$

III. $\int_a^b [f(x)g(x)]dx = -6$

(A) I only (B) II only (C) III only (D) II and III only (E) I, II, and III

(15) $\int_{-2}^{3} |x+1| dx =$