

AP Calculus AB  
Review 07, No Calculator

Complete all the following on notebook paper.

\_\_\_\_\_ 1.

$$\frac{d}{dx}(\ln e^{2x}) =$$

- (A)  $\frac{1}{e^{2x}}$       (B)  $\frac{2}{e^{2x}}$       (C)  $2x$       (D)  $1$       (E)  $2$

\_\_\_\_\_ 2.

The area of the region bounded by the curve  $y = e^{2x}$ , the  $x$ -axis, the  $y$ -axis, and the line  $x = 2$  is equal to

- (A)  $\frac{e^4}{2} - e$       (B)  $\frac{e^4}{2} - 1$       (C)  $\frac{e^4}{2} - \frac{1}{2}$   
(D)  $2e^4 - e$       (E)  $2e^4 - 2$

\_\_\_\_\_ 3.

If  $\sin x = e^y$ ,  $0 < x < \pi$ , what is  $\frac{dy}{dx}$  in terms of  $x$ ?

- (A)  $-\tan x$       (B)  $-\cot x$       (C)  $\cot x$       (D)  $\tan x$       (E)  $\csc x$

\_\_\_\_\_ 4.

$$\int_0^1 \sqrt{x^2 - 2x + 1} \, dx \text{ is}$$

- (A)  $-1$   
(B)  $-\frac{1}{2}$   
(C)  $\frac{1}{2}$   
(D)  $1$   
(E) none of the above

\_\_\_\_\_ 5.

A region in the plane is bounded by the graph of  $y = \frac{1}{x}$ , the  $x$ -axis, the line  $x = m$ , and the line  $x = 2m$ ,  $m > 0$ . The area of this region

- (A) is independent of  $m$ .
- (B) increases as  $m$  increases.
- (C) decreases as  $m$  increases.
- (D) decreases as  $m$  increases when  $m < \frac{1}{2}$ ; increases as  $m$  increases when  $m > \frac{1}{2}$ .
- (E) increases as  $m$  increases when  $m < \frac{1}{2}$ ; decreases as  $m$  increases when  $m > \frac{1}{2}$ .

\_\_\_\_\_ 6.

If  $\frac{dy}{dx} = \tan x$ , then  $y =$

- (A)  $\frac{1}{2} \tan^2 x + C$
- (B)  $\sec^2 x + C$
- (C)  $\ln |\sec x| + C$
- (D)  $\ln |\cos x| + C$
- (E)  $\sec x \tan x + C$

\_\_\_\_\_ 7.

If  $y = x^2 e^x$ , then  $\frac{dy}{dx} =$

- (A)  $2xe^x$
- (B)  $x(x + 2e^x)$
- (C)  $xe^x(x + 2)$
- (D)  $2x + e^x$
- (E)  $2x + e$

\_\_\_\_\_ 8.

$\int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x} dx =$

- (A)  $\ln \sqrt{2}$
- (B)  $\ln \frac{\pi}{4}$
- (C)  $\ln \sqrt{3}$
- (D)  $\ln \frac{\sqrt{3}}{2}$
- (E)  $\ln e$

\_\_\_\_\_ 9.

If  $f'(x) = -f(x)$  and  $f(1) = 1$ , then  $f(x) =$

- (A)  $\frac{1}{2} e^{-2x+2}$
- (B)  $e^{-x-1}$
- (C)  $e^{1-x}$
- (D)  $e^{-x}$
- (E)  $-e^x$

10.

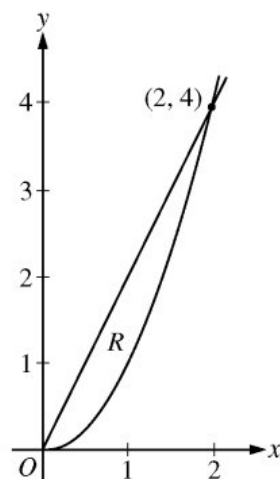
If a function  $f$  is continuous for all  $x$  and if  $f$  has a relative maximum at  $(-1, 4)$  and a relative minimum at  $(3, -2)$ , which of the following statements must be true?

- (A) The graph of  $f$  has a point of inflection somewhere between  $x = -1$  and  $x = 3$ .
- (B)  $f'(-1) = 0$
- (C) The graph of  $f$  has a horizontal asymptote.
- (D) The graph of  $f$  has a horizontal tangent line at  $x = 3$ .
- (E) The graph of  $f$  intersects both axes.

11. 2009—AB4

Let  $R$  be the region in the first quadrant enclosed by the graphs of  $y = 2x$  and  $y = x^2$ , as shown in the figure above.

- (a) Find the area of  $R$ .
- (b) The region  $R$  is the base of a solid. For this solid, at each  $x$  the cross section perpendicular to the  $x$ -axis has area  $A(x) = \sin\left(\frac{\pi}{2}x\right)$ . Find the volume of the solid.
- (c) Another solid has the same base  $R$ . For this solid, the cross sections perpendicular to the  $y$ -axis are squares. Write, but do not evaluate, an integral expression for the volume of the solid.



12. 2009—AB5

$x$	2	3	5	8	13
$f(x)$	1	4	-2	3	6

Let  $f$  be a function that is twice differentiable for all real numbers. The table above gives values of  $f$  for selected points in the closed interval  $2 \leq x \leq 13$ .

- (a) Estimate  $f'(4)$ . Show the work that leads to your answer.
- (b) Evaluate  $\int_2^{13} (3 - 5f'(x)) dx$ . Show the work that leads to your answer.
- (c) Use a left Riemann sum with subintervals indicated by the data in the table to approximate  $\int_2^{13} f(x) dx$ . Show the work that leads to your answer.
- (d) Suppose  $f'(5) = 3$  and  $f''(x) < 0$  for all  $x$  in the closed interval  $5 \leq x \leq 8$ . Use the line tangent to the graph of  $f$  at  $x = 5$  to show that  $f(7) \leq 4$ . Use the secant line for the graph of  $f$  on  $5 \leq x \leq 8$  to show that  $f(7) \geq \frac{4}{3}$ .