

AB Review 02, Use your calculator ONLY on #11.

1. If  $y = xy + x^2 + 1$ , then when  $x = -1$ ,  $\frac{dy}{dx}$  is

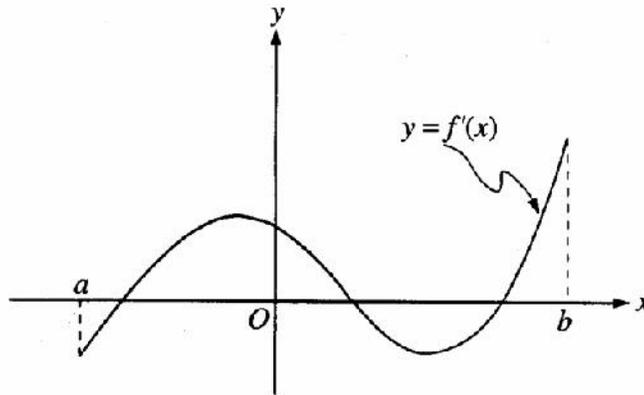
- (A)  $\frac{1}{2}$       (B)  $-\frac{1}{2}$       (C)  $-1$       (D)  $-2$       (E) nonexistent

2. If  $f(x) = x^2 + 2x$ , then  $\frac{d}{dx}(f(\ln x)) =$

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

3. Let  $f$  be the function defined by  $f(x) = \begin{cases} x^3 & \text{for } x \leq 0 \\ x & \text{for } x > 0 \end{cases}$ . Which of the following statements about  $f$  is true?

- (A)  $f$  is an odd function      (B)  $f$  is discontinuous at  $x = 0$       (C)  $f$  has a relative maximum  
(D)  $f'(0) = 0$       (E)  $f'(x) > 0$  for  $x \neq 0$



4. The graph of  $f'$ , the derivative of  $f$ , is shown in the figure above. Which of the following describes all relative extrema of  $f$  on the open interval  $(a, b)$ ?

- (A) One relative maximum and two relative minima
- (B) Two relative maxima and one relative minimum
- (C) Three relative maxima and one relative minimum
- (D) One relative maximum and three relative minima
- (E) Three relative maxima and two relative minima

5. An antiderivative for  $\frac{1}{x^2 - 2x + 2}$  is

- (A)  $-(x^2 - 2x + 2)^{-2}$
- (B)  $\ln(x^2 - 2x + 2)$
- (C)  $\ln\left|\frac{x-2}{x+1}\right|$
- (D)  $\text{Arcsec}(x-1)$
- (E)  $\text{Arctan}(x-1)$

6. The region enclosed by the  $x$ -axis, the line  $x = 3$ , and the curve  $y = \sqrt{x}$  is rotated about the  $x$ -axis. What is the volume of the solid generated?

- (A)  $3\pi$
- (B)  $3\sqrt{3}\pi$
- (C)  $\frac{9}{2}\pi$
- (D)  $9\pi$
- (E)  $\frac{36\sqrt{3}}{5}\pi$

7.  $\int_0^{\sqrt{3}} \frac{dx}{\sqrt{4-x^2}} =$

- (A)  $\frac{\pi}{3}$       (B)  $\frac{\pi}{4}$       (C)  $\frac{\pi}{6}$       (D)  $\frac{1}{2}\ln 2$       (E)  $-\ln 2$

8. If  $\frac{dy}{dx} = 2y^2$  and if  $y = -1$  when  $x = 1$ , then when  $x = 2$ ,  $y =$

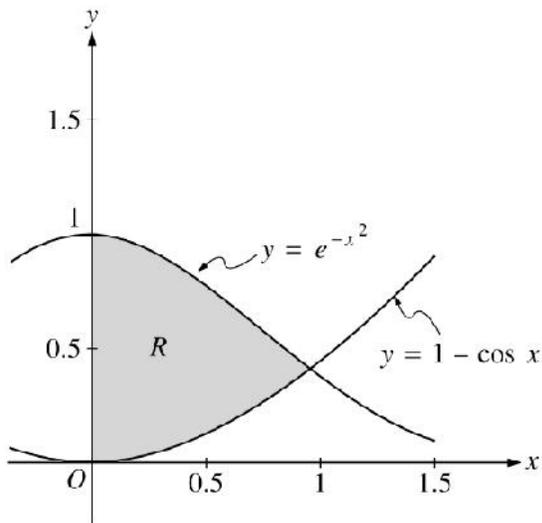
- (A)  $-\frac{2}{3}$       (B)  $-\frac{1}{3}$       (C) 0      (D)  $\frac{1}{3}$       (E)  $\frac{2}{3}$

9. The top of a 25-foot ladder is sliding down a vertical wall at a constant rate of 3 feet per minute. When the top of the ladder is 7 feet from the ground, what is the rate of change, in feet per minute, of the distance between the bottom of the ladder and the wall?

- (A)  $-\frac{7}{8}$       (B)  $-\frac{7}{24}$       (C)  $\frac{7}{24}$       (D)  $\frac{7}{8}$       (E)  $\frac{21}{25}$

10. At what value of  $x$  does the graph of  $y = \frac{1}{x^2} - \frac{1}{x^3}$  have a point of inflection?

- (A) 0      (B) 1      (C) 2      (D) 3      (E) At no value of  $x$

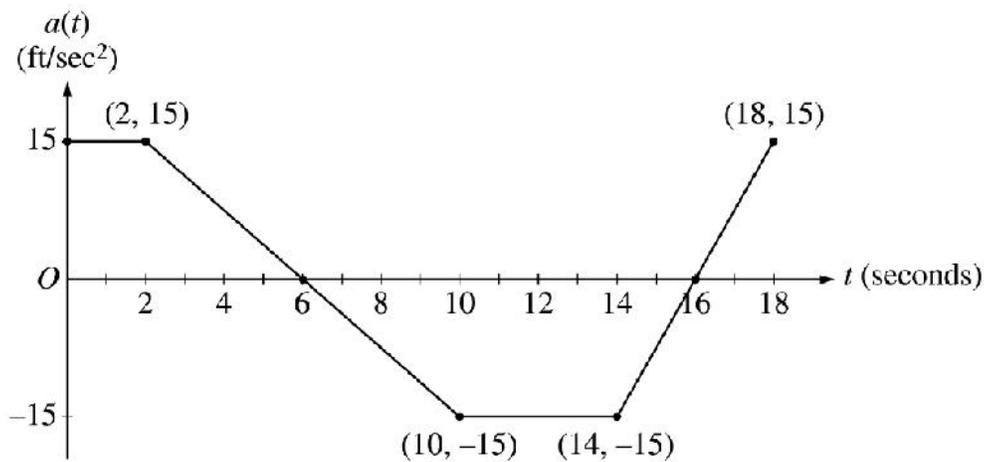


11. (Calculator Permitted) (2000-AB 1) Let  $R$  be the region in the first quadrant enclosed by the graphs of  $y = e^{-x^2}$ ,  $y = 1 - \cos x$ , and the  $y$ -axis, as shown in the figure above.

(a) Find the area of the region.

(b) Find the volume of the solid generated when the region  $R$  is revolved about the line  $y = 2$ .

(c) The region  $R$  is the base of a solid. For this solid, each cross section perpendicular to the  $x$ -axis is a semicircle. Find the volume of this solid.



12. (2001, AB-3) A car is traveling on a straight road with velocity 55 ft/sec at time  $t = 0$ . For  $0 \leq t \leq 18$  seconds, the car's acceleration  $a(t)$ , in  $\text{ft/sec}^2$ , is a piecewise linear function defined by the graph at right.

(a) Is the velocity of the car increasing at  $t = 2$  seconds? Why or why not?

(b) At what time in the interval  $0 \leq t \leq 18$ , other than  $t = 0$ , is the velocity of the car 55 ft/sec? Why?

(c) On the time interval  $0 \leq t \leq 18$ , what is the car's absolute maximum velocity, in ft/sec, and at what time does it occur? Justify your answer.

(d) At what times in the interval  $0 \leq t \leq 18$ , if any, is the car's velocity equal to zero? Justify your answer.