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

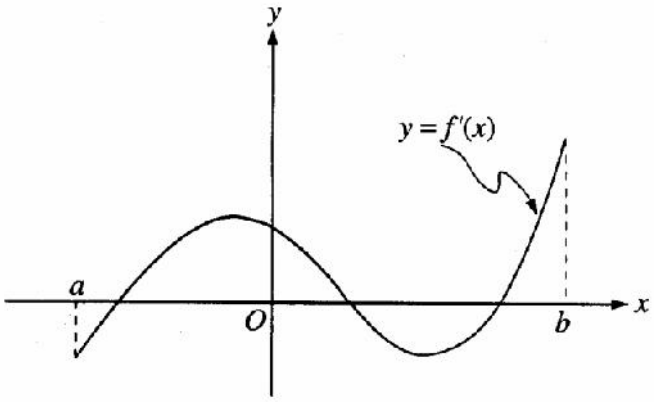
2. If $f(x) = x^2 + 2x$, then $\frac{d}{dx}\left(f(\ln x)\right) =$

(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 $f(x) = \begin{cases} x^3 & \text{for } x \le 0 \\ x & \text{for } x > 0 \end{cases}$. 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 $\dfrac{1}{x^2-2x+2}$ is

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

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) 3π (B) $3\sqrt{3}\pi$ (C) $\dfrac{9}{2}\pi$ (D) 9π (E) $\dfrac{36\sqrt{3}}{5}\pi$

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 $x = 2$, $y =$

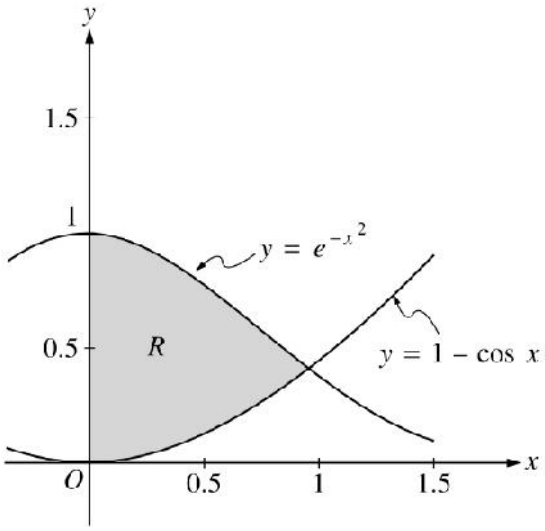
(A) $-\frac{2}{3}$ (B) $-\frac{1}{3}$ (C) 0 (D) $\frac{1}{3}$ (E) $\frac{2}{3}$

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

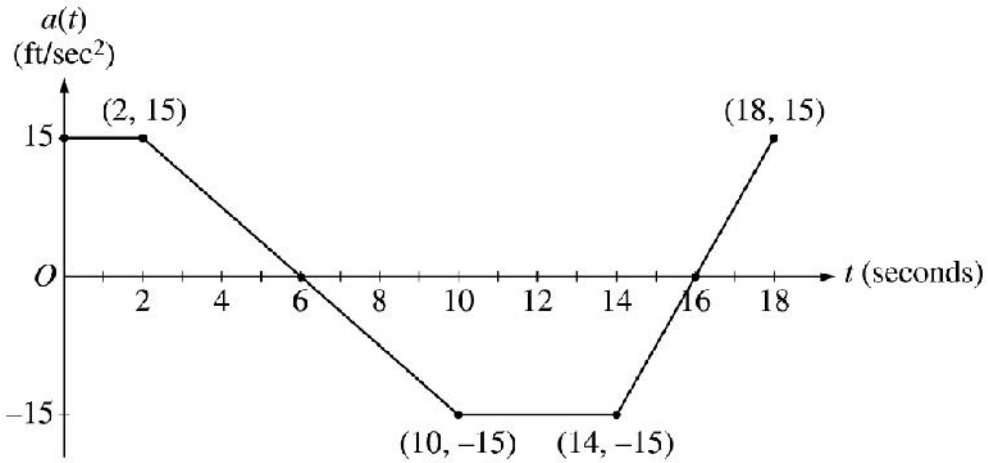


11. (Calculator Permitted) (2000-AB 1) Let R be the region in the first quadrant enclosed by the graphs of $y = e^{-x^2}$, $y = 1 - \cos x$, and the y-axis, as shown in the figure above.

(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 $0 \le t \le 18$ seconds, the car's acceleration $a(t)$, in 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 $0 \le t \le 18$, other than $t = 0$, is the velocity of the car 55 ft/sec? Why?

(c) On the time interval $0 \le t \le 18$, 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 $0 \le t \le 18$, if any, is the car's velocity equal to zero? Justify your answer.