

CALCULATOR INACTIVE

1. $\int_0^3 (x+1)^{1/2} dx =$

- (A) $\frac{21}{2}$ (B) 7 (C) $\frac{16}{3}$ (D) $\frac{14}{3}$ (E) $-\frac{1}{4}$

2. $\int x\sqrt{4-x^2} dx =$

- (A) $\frac{(4-x^2)^{3/2}}{3} + C$ (B) $-(4-x^2)^{3/2} + C$ (C) $\frac{x^2(4-x^2)^{3/2}}{3} + C$
 (D) $-\frac{x^2(4-x^2)^{3/2}}{3} + C$ (E) $-\frac{(4-x^2)^{3/2}}{3} + C$

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

- (A) $\frac{e^3}{2}$ (B) $\frac{e^3-1}{2}$ (C) $\frac{e^4-e}{2}$ (D) e^3-1 (E) e^4-e

4. The region in the first quadrant bounded by the graph of $y = \sec x$, $x = \frac{\pi}{4}$, and the axes is rotated about the x -axis. What is the volume of the solid generated?

- (A) $\frac{\pi^2}{4}$ (B) $\pi-1$ (C) π (D) 2π (E) $\frac{8\pi}{3}$

5. $\int_0^1 \frac{x+1}{x^2+2x-3} dx$ is

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

6. If $\int_{-1}^1 e^{-x^2} dx = k$, then $\int_{-1}^0 e^{-x^2} dx =$

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

7. If $\int_{-2}^2 (x^7+k) dx = 16$, then $k =$

- (A) -12 (B) -4 (C) 0 (D) 4 (E) 12

8. If the position of a particle on the x -axis at time t is $-5t^2$, then the average velocity of the particle for $0 \leq t \leq 3$ is

- (A) -45 (B) -30 (C) -15 (D) -10 (E) -5

9. $\lim_{x \rightarrow 0} (x \csc x)$ is

- (A) $-\infty$ (B) -1 (C) 0 (D) 1 (E) ∞

10. $\frac{d}{dx} \int_2^x \sqrt{1+t^2} dt =$

- (A) $\frac{x}{\sqrt{1+x^2}}$ (B) $\sqrt{1+x^2} - 5$ (C) $\sqrt{1+x^2}$
(D) $\frac{x}{\sqrt{1+x^2}} - \frac{1}{\sqrt{5}}$ (E) $\frac{1}{2\sqrt{1+x^2}} - \frac{1}{2\sqrt{5}}$

11. $\int \frac{dx}{(x-1)(x+2)} =$

- (A) $\frac{1}{3} \ln \left| \frac{x-1}{x+2} \right| + C$ (B) $\frac{1}{3} \ln \left| \frac{x+2}{x-1} \right| + C$ (C) $\frac{1}{3} \ln |(x-1)(x+2)| + C$
(D) $(\ln|x-1|)(\ln|x+2|) + C$ (E) $\ln|(x-1)(x+2)^2| + C$

12. If the velocity of a particle moving along the x -axis is $v(t) = 2t - 4$ and if at $t = 0$ its position is 4, then at any time t its position $x(t)$ is

- (A) $t^2 - 4t$ (B) $t^2 - 4t - 4$ (C) $t^2 - 4t + 4$ (D) $2t^2 - 4t$ (E) $2t^2 - 4t + 4$

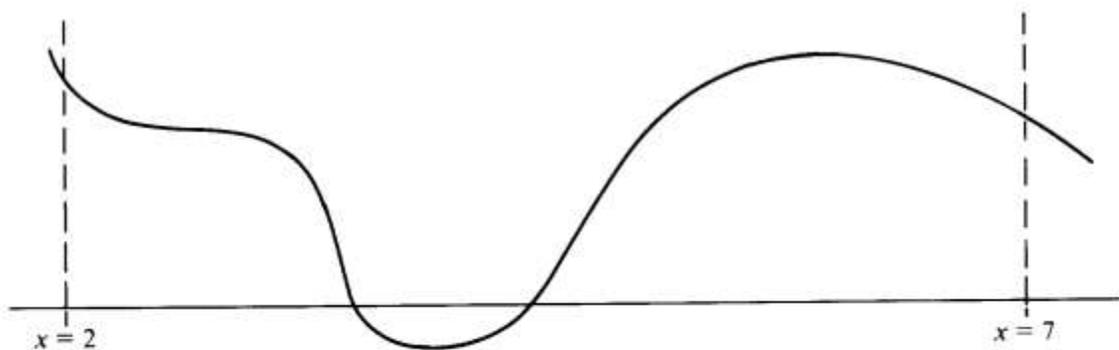
13. If f and g are twice differentiable functions such that $g(x) = e^{f(x)}$ and $g''(x) = h(x)e^{f(x)}$, then $h(x) =$

- (A) $f'(x) + f''(x)$ (B) $f'(x) + (f''(x))^2$ (C) $(f'(x) + f''(x))^2$
(D) $(f'(x))^2 + f''(x)$ (E) $2f'(x) + f''(x)$

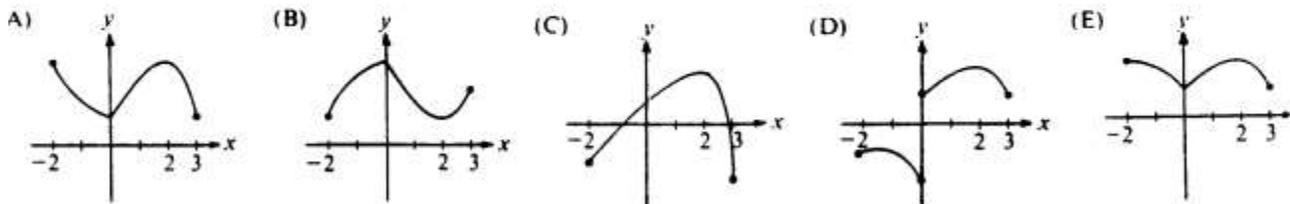
14. $\lim_{h \rightarrow 0} \frac{\int_1^{1+h} \sqrt{x^5 + 8} dx}{h}$ is

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

15.



15. The graph of $y = f(x)$ on the closed interval $[2, 7]$ is shown above. How many points of inflection does this graph have on this interval?
- (A) One (B) Two (C) Three (D) Four (E) Five
16. The area of a circular region is increasing at a rate of 96π square meters per second. When the area of the region is 64π square meters, how fast, in meters per second, is the radius of the region increasing?
- (A) 6 (B) 8 (C) 16 (D) $4\sqrt{3}$ (E) $12\sqrt{3}$
17. $\lim_{x \rightarrow \infty} (1 + 5e^x)^{\frac{1}{x}}$ is
- (A) 0 (B) 1 (C) e (D) e^5 (E) nonexistent
18. The base of a solid is the region enclosed by the graph of $y = e^{-x}$, the coordinate axes, and the line $x = 3$. If all plane cross sections perpendicular to the x -axis are squares, then its volume is
- (A) $\frac{(1 - e^{-6})}{2}$ (B) $\frac{1}{2}e^{-6}$ (C) e^{-6} (D) e^{-3} (E) $1 - e^{-3}$
19. Let f be a function that is continuous on the closed interval $[-2, 3]$ such that $f'(0)$ does not exist, $f'(2) = 0$, and $f''(x) < 0$ for all x except $x = 0$. Which of the following could be the graph of f ?



20.

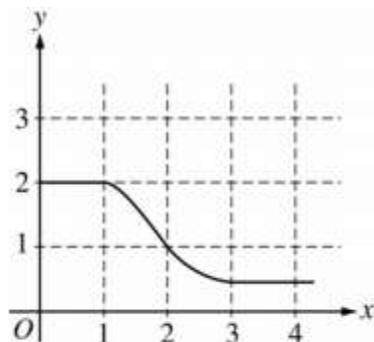
If $\frac{dy}{dt} = -2y$ and if $y = 1$ when $t = 0$, what is the value of t for which $y = \frac{1}{2}$?

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

CALCULATOR ACTIVE:

21. The graph of the function $y = x^3 + 6x^2 + 7x - 2\cos x$ changes concavity at $x =$
- (A) -1.58 (B) -1.63 (C) -1.67 (D) -1.89 (E) -2.33

22.



The graph of f is shown in the figure above. If $\int_1^3 f(x)dx = 2.3$ and $F'(x) = f(x)$, then $F(3) - F(0) =$

- (A) 0.3 (B) 1.3 (C) 3.3 (D) 4.3 (E) 5.3
23. The base of a solid S is the region enclosed by the graph of $y = \sqrt{\ln x}$, the line $x = e$, and the x -axis. If the cross sections of S perpendicular to the x -axis are squares, then the volume of S is
- (A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) 1 (D) 2 (E) $\frac{1}{3}(e^3 - 1)$
24. If the derivative of f is given by $f'(x) = e^x - 3x^2$, at which of the following values of x does f have a relative maximum value?
- (A) -0.46 (B) 0.20 (C) 0.91 (D) 0.95 (E) 3.73
25. At time $t \geq 0$, the acceleration of a particle moving on the x -axis is $a(t) = t + \sin t$. At $t = 0$, the velocity of the particle is -2 . For what value t will the velocity of the particle be zero?
- (A) 1.02 (B) 1.48 (C) 1.85 (D) 2.81 (E) 3.14

KEY:

1. D
2. E
3. B
4. C
5. E
6. D
7. D
8. C
9. D
10. C
11. A
12. C
13. D
14. C
15. C
16. A
17. C
18. A
19. E
20. C
21. D
22. D
23. C
24. C
25. B