

For all questions, answer E. means none of the above answers is correct.

- Let  $f(x) = 3^x$  what is  $f'(x)$ ?  
A)  $\frac{3^x}{\ln 3}$       B)  $3^x$       C)  $3^x \ln 3$       D)  $3^{x \ln 3}$       E) NOTA
- Let  $f(x) = \sqrt{x^2 + 2x - 3} + \ln(x - 1)$ . What is the range of  $f(x)$ ?  
A)  $(-\infty, -3] \cup [1, \infty)$       B)  $[1, \infty)$       C)  $(1, \infty)$   
D)  $(-\infty, \infty)$       E) NOTA
- What is the slope of the tangent line to the curve  $y^2 = x^3$  when  $y = 8$ ?  
A) -48      B) 3      C)  $4\sqrt{3}$       D) 48      E) NOTA
- What is the average value of  $3^x$  on the interval  $[0, 2]$  rounded to the nearest tenth?  
A) 4.0      B) 4.1      C) 4.4      D) 8.8      E) NOTA
- What is the volume of the solid formed by revolving the finite region bound by the curves  $x = 1$ ,  $y = -1$ ,  $x = 3$ , and  $y = x$  around the line  $x = -1$ ?  
A)  $\frac{8\pi}{3}$       B)  $\frac{40\pi}{3}$       C)  $\frac{56\pi}{3}$       D)  $\frac{112\pi}{3}$       E) NOTA
- Evaluate:  $\lim_{x \rightarrow 0} \frac{x^2 - 2x + 1}{\cos x}$   
A) -1      B) 0      C) 1      D)  $\infty$       E) NOTA
- Given:  $f(x) = 3 \arcsin \frac{x}{5}$ . What is  $f'(4)$ ?  
A)  $-1/3$       B)  $\frac{3}{\sqrt{41}}$       C)  $1/3$       D) 1      E) NOTA
- What is the y-intercept of the tangent line to  $y = 2^x + \sin x$  at  $x = 3$  (rounded to the nearest tenth)?  
A) -5.5      B) 11.5      C) 21.8      D) 27.7      E) NOTA

9. A farmer has a barn with a wall 60 feet long. He is going to use some or all of the wall, along with 60 feet of fencing to form a rectangular enclosure. What is the maximum area he can fence in?

- A) 225      B) 400      C) 450      D) 525      E) NOTA

10. Given:  $f(x) = 3^{x^2+1}$ . What is  $f'(-1)$ ?

- A)  $-9\ln 2$       B) 9      C)  $9\ln 2$       D)  $18\ln 2$       E) NOTA

11. What does the second derivative test indicate about the function  $f(x) = 3 - x^4$  at  $x = 0$ ?

- A)  $f(x)$  is at a local minimum  
B)  $f(x)$  is concave up  
C)  $f(x)$  has a point of inflection  
D) the test is inconclusive  
E) NOTA

12. Evaluate:  $\int_0^{\sqrt{2}} \sqrt{4-x^2} dx$ .

- A) 1      B)  $1 + \frac{\pi}{2}$       C)  $2\sqrt{2}$       D)  $2\pi$       E) NOTA

13. Given  $f(x) = x^2 + \cos x + \frac{1}{x+4}$  what is the average value of  $f'(x)$  on the interval  $[-\pi, \pi]$ ?

- A)  $\frac{2\pi}{4-\pi^2}$       B)  $\frac{1}{\pi^2-16}$       C)  $\frac{\pi^2 + \pi - 16}{\pi(\pi^2 - 16)}$   
D)  $\frac{2\pi}{16-\pi^2}$       E) NOTA

14. Evaluate the limit, rounding to the nearest hundredth:  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{3 - \log_{(\pi/2)} x^3}{\cos x}$

- A) -4.23      B) -1.23      C) 1.23      D) 4.23      E) NOTA

15. What is the area enclosed by the cardioid described in polar coordinates as  $r(\theta) = 1 + \cos \theta$ ?

- A)  $\pi$       B)  $\frac{3\pi}{2}$       C)  $\frac{5\pi}{2}$       D)  $3\pi$       E) NOTA

16. Evaluate using the trapezoidal rule with  $n = 4$  (round to the nearest tenth):  $\int_0^2 x^3 dx$

- A) 2.3      B) 4.0      C) 4.3      D) 6.3      E) NOTA

17. The normal line to  $y = 5 - x^3$  at  $x = 3$  intersects the line  $y = 2x - 1$  at the point  $(a, b)$ . What is  $a + b$  rounded to the nearest tenth?

- A) -33.3      B) -22.5      C) -10.8      D) 5.6      E) NOTA

18. Let  $f(x) = \sin^2(2x + 5)$ . What is  $f'(x)$ ?

- A)  $2 \sin(2x + 5)$       B)  $4 \sin(2x + 5)$       C)  $2 \sin(2x + 5) \cos(2x + 5)$   
D)  $4 \sin(2x + 5) \cos(2x + 5)$       E) NOTA

19. Evaluate the indefinite integral:  $\int (2x^3 + e^{2x}) dx$

- A)  $\frac{x^4 + e^{2x}}{2} + C$       B)  $\frac{x^4}{4} + \frac{e^{2x}}{2} + C$       C)  $2x^4 + e^{2x} + C$   
D)  $6x^2 + 2e^{2x} + C$       E) NOTA

20. Let  $f(x) = \sqrt{4 - x^2}$ . What is the domain of  $f'(x)$ ?

- A)  $(-2, 2)$       B)  $[-2, 2]$       C)  $(-\infty, -2) \cup (2, \infty)$   
D)  $(-\infty, -2] \cup [2, \infty)$       E) NOTA

21. Evaluate:  $\lim_{x \rightarrow \infty} \frac{8x^2 - 5x + 6}{2x^2 - 1}$

- A) 0      B) 4      C) 8      D)  $\infty$       E) NOTA

22. A cube has sides of length 2.00. Use differentials to determine the propagated error in a calculation of the cube's volume caused by a .05 deviation in the side length. Round to the nearest hundredth.

- A) .59      B) .60      C) .62      D) .63      E) NOTA

23. A solid has square cross sections perpendicular to the  $x$ -axis with an edge in the region bound by  $y = x^2$ , the  $x$ -axis,  $x = 1$  and  $x = 3$ . What is its volume?

- A)  $\frac{26}{3}$       B) 20      C) 32      D)  $\frac{242}{5}$       E) NOTA

24. Let  $f(x) = \frac{e^x}{\ln x}$ . What is  $f'(x)$ ?

A)  $\frac{e^x(x \ln x - 1)}{x(\ln x)}$

B)  $\frac{e^x(x \ln x - 1)}{(\ln x)^2}$

C)  $\frac{e^x(x \ln x - 1)}{x(\ln x)^2}$

D)  $\frac{e^x(\ln x - 1)}{x(\ln x)^2}$

E) NOTA

25. Let  $f(x) = \int_a^{x^2} \sqrt{t} \cos t dt$ . What is  $f'(\sqrt{\pi})$ ?

A)  $-2\pi$

B)  $-\sqrt{\pi}$

C)  $\sqrt{\pi}$

D)  $4\pi$

E) NOTA

26. Evaluate:  $\int (x + x^{-1}) dx$

A)  $\frac{x^2}{2} + \ln|x| + C$

B)  $\frac{x^2}{2} + \log|x| + C$

C)  $x^2 + \ln|x| + C$

D)  $x^2 + \log|x| + C$

E) NOTA

27. A particle is at rest up until time  $t = 0$ , and subsequently its velocity is described by the equation  $v(t) = t^3 + \cos t$ . What is the displacement of the particle from its initial position at time  $t = 2$  (round to the nearest tenth)?

A) 2.4

B) 3.2

C) 3.9

D) 4.6

E) NOTA

28. Let  $f(x) = |x|$ . Evaluate:  $\lim_{x \rightarrow 0^-} f'(x)$

A) -1

B) 0

C) 1

D) does not exist

E) NOTA

29. Evaluate:  $\lim_{x \rightarrow 2} \frac{x^2 + x + 6}{x - 2}$

A) 0

B) 2

C) 5

D) does not exist

E) NOTA

30. Given:  $f(x) = (2x + 1)(x - 3)$ . What is  $f'(2)$ ?

A) 3

B) 8

C) 13

D) 15

E) NOTA