Multiple choice test. The answer choice E as NOTA represents 'none of the above'.

1. $\lim_{x\to 3}\frac{3x^2-27}{x-3}$ is

   a. 0 b. 6 c. 18 d. doesn't exist e. NOTA

2. Which is a slope for the tangent line to the graph of $x^2+3y^2 = 6$ at x = 2.

   a. -2 b. $-\frac{1}{3}$ c. $\frac{1}{3}$ d. $\sqrt{6}$ e. NOTA

3. Find f'(x) for $f(x) = x^2(4x^3 + 5)^4$

   a. $(4x^3+5)^3$ b. $8x(4x^3+5)^3$ c. $8x^3(4x^3+5)^3$ d. $(56x^4+10x)(4x^3+5)^3$ e. NOTA

4. $\lim_{x\to 0}\frac{\csc(x)}{\cot(x)}$ is

   a. -1 b. 0 c. 1 d. doesn't exist e. NOTA

5. A rocket is fired vertically upward, it is y feet above the ground x seconds after being fired, where $y = 560x - 16x^2$ and the positive direction is upward. Find its maximum height(feet).

   a. 560 b. 4900 c. 14700 d. 19600 e. NOTA

6. The outside diameter of a thin spherical shell is 12 feet. If the shell is 0.3 inch thick, the volume of the shell is (cu. ft.)

   a. 3.6π b. 14.4π c. 43.2π d. 172.8π e. NOTA

7. If $y = \frac{3x}{1-3x}$, then $\frac{d^n y}{dx^n} =$

   a. $\frac{1}{(1-3x)^{n+1}}$ b. $\frac{3}{(1-3x)^{n+1}}$ c. $\frac{3n!}{(1-3x)^{n+1}}$ d. $\frac{3^n(n!)}{(1-3x)^{n+1}}$ e. NOTA

8. A water tank in the shape of an inverted cone is being drained at a rate of 5 m^3/min. The altitude of the cone is 20 m, and the radius is 10 m. How fast is the water level being lowered when the water is 6 m deep (m^3/min)?

   a. $\frac{1}{9\pi}$ b. $\frac{5}{27\pi}$ c. $\frac{1}{3\pi}$ d. $\frac{5}{9\pi}$ e. NOTA

9. Evaluate $\int_{-4}^{6}|x+3|dx$

   a. 41 b. 40 c. 17 d. -11 e. NOTA

10. $\lim_{x\to 0} \frac{\sec(\frac{\pi}{6}+x)-\sec(\frac{\pi}{6})}{x}$ is

a. $\frac{1}{2}$ b. $\frac{1}{3}$ c. 2 d. 3 e. NOTA

11. A ladder, 12 feet long, is leaning against a wall. If the foot of the ladder slides away from the wall along level ground, what is the instantaneous rate of change of the top of the ladder with the foot of the ladder moving out from the wall at 1 ft/sec, when the foot is 6 feet from the wall?

a. $\frac{-\sqrt{3}}{3}$ b. $\frac{\sqrt{3}}{3}$ c. -1 d. $\frac{\sqrt{3}}{36}$ e. NOTA

12. How many points of inflection does the function $f(x) = \frac{x+1}{x^2+2x+2}$ have?

a. 0 b. 1 c. 2 d. 3 e. NOTA

13. A sailboat is stranded 3 miles west off the nearest shore (Point Hope). The nearest phone is 5 miles south of Point Hope. If our sailor can row a raft 2 mph and jog 4 mph, how far south of Point Hope should our sailor aim for to reach that phone in the least amount of time (miles)?

a. 1.27 b. 1.5 c. 1.73 d. 2 e. NOTA

14. What value of x does $f(x) = (x^2+1)e^{-x}$ for $-3 \le x \le 3$ reach its absolute maximum?

a. -3 b. 0 c. 1 d. 3 e. NOTA

15. A particle moves along the x-axis so that its position is given be $x(t) = t^3 - 6t^2 + 9t + 5$. What is the total distance traveled by the particle from t=0 to t=2?

a. 2 b. 6 c. 7 d. 21 e. NOTA

16. If $f'(x) = \frac{1}{9+4x^2}$, find f(x)

a. $\frac{1}{6}\arctan(\frac{2x}{3})+c$ b. $\frac{1}{3}\arctan(\frac{2x}{3})+c$

c. $8x \cdot \ln(9+4x^2)+c$ d. $8 \cdot \ln(9+4x^2)+c$ e. NOTA

17. Use two iterations of Newton's Method, starting with $x_0 = 1$ to find the root of the function $f(x)=x^5+x^2-3$ correct to three decimal places.

a. 0.857 b. 1.143 c. 1.119 d. 1.266 e. NOTA

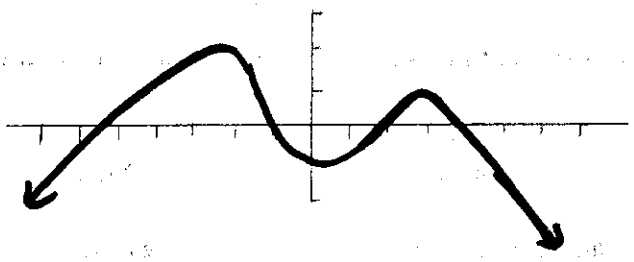
18. What is the domain of f '(x) if $f(x)=\sqrt{1-\cos x}$?

a. $(-\infty,\infty)$ b. $[0,2\pi]$ c. $(0,2\pi)$ d. $x \neq n \cdot 2\pi, n \in Integers$ e. NOTA

19. Let f be a differentiable function, defined for all real numbers x, where $f'(x)= ax^2+bx$, $f'(1)=8$, $f''(1)=20$, and $\int_{-3}^{3} f(x)dx= -6$. Find f(x)

a. $2x^3+x^2-6$ b. $12x^2-4x-6$ c. $4x^3-2x^2+5$ d. $12x^2-4x$ e. NOTA

20. The figure shows the graph of f '(x), the derivative of f. The domain of f is the set of real numbers x such that $-6 \le x \le 6$. For what values of x is the graph of f concave up?



a. $(-6,2)\cup(0,3)$ b. $(-1,2)$ c. $(-5,1)\cup(2,4)$ d. $(-6,5)\cup(-1,2)\cup(4,6)$ e. NOTA

21. Write the equation(s) of the horizontal asymptote of $f(x)=\frac{4x^2-36}{x^2-4}$

a. $y=\pm 2$ b. $y=4$ c. $y=\pm 3$ d. $y=9$ e. NOTA

22. Find the value of c in (5,8) which satisfies the Mean Value Theorem for the equation $f(x)= \ln(x-4)$ on the interval [5,8].

a. ln 2.5 b. $\frac{3}{\ln 4}+4$ c. $\frac{\ln 8}{3}$ d. $\frac{3}{\ln 7}+4$ e. NOTA

23. The derivative of $f(x)=\frac{\ln(\sin(9x))}{9}$, where $\sin(9x)>0$ is

a. tan(9x) b. cot(9x) c. $\frac{1}{9}\csc(9x)$ d. $\frac{1}{9}\tan(9x)$ e. NOTA

24. Suppose that f has a positive derivative for all values of x and that f(2)=0. Which statement must be false of the function $g(x)=\int_0^x f(t)dt$?

a. g and $\frac{dg}{dx}$ are both continuous

b. g has a local max. at x=2

c. graph of $\frac{dg}{dx}$ crosses the x-axis

d. g is twice differentiable function of x

e. NOTA

25. If f(x)= sin x - cos x, then $f^{(2001)}(x)$=

a. sin x - cos x b. cos x - sin x c. sin x + cos x d. -sin x - cos x e. NOTA

26. State the domain of the derivative of the function $f(t)=\sqrt{t^3-1}$

a. $[1,\infty)$ b. $(-\infty,-1)\cup(1,\infty)$ c. $(-\infty,0)\cup(0,\infty)$ d. $[2,\infty)$ e. NOTA

27. Find the approximation error of the function $f(x)=\sin(x^2)$ when x changes from 0.5 to 0.51

a. -0.0025 b. 0.0025 c. 0.0097 d. 0.0122 e. NOTA

28. Find the value of k, a constant, where $f(x)=x^3+4x^2+5x+k$ has 5 as its relative minimum.

a. -2 b. 5 c. 7 d. 20 e. NOTA

29. Let $h(x)=f\left(\frac{g(x)}{x^3+1}\right)$, f(1)=2, f(2)=6, f'(1)=3, f'(2)=8, g(1)=4, g'(1)=5. Find h'(1).

a. -4 b. -1/2 c. 1/2 d. 44 e. NOTA

30. If $f(x)=x^2+6x$, x>0, find the derivative of the inverse of f(x) in terms of x.

a. $\frac{-(2x+6)}{(x^2+6x)^2}$ b. $2x^2+12x+6$ c. $\frac{x-6}{x}$ d. $\frac{1}{2x+6}$ e. NOTA