

Calculus Individual Test  
February 5, 1994

NOTA means None of the Above

- Find  $x$  so that the distance between the points  $(6,-1)$  and  $(x,9)$  is 12.  
A.  $2\sqrt{31}$     B.  $6+2\sqrt{11}$     C.  $6+4\sqrt{10}$     D.  $-6+4\sqrt{5}$     E. NOTA
- Find the domain of  $f(x) = \frac{1}{\sqrt{3-2x}}$ .  
A.  $(-\infty, \frac{3}{2})$     B.  $[\frac{3}{2}, \infty)$     C.  $(\frac{3}{2}, \infty)$     D.  $(-\infty, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$     E. NOTA
- Find the limit:  $\lim_{h \rightarrow 0} \frac{\sqrt{(x+h)+2} - \sqrt{x+2}}{h}$   
A.  $\sqrt{x+2}$     B. Does not exist    C. 0    D.  $\frac{1}{2\sqrt{x+2}}$     E. NOTA
- A particle moves along the plane according to the law  $x = t^2 + 2t$ , and  $y = 2t^3 - 6t$ .  
Find the slope of the tangent line when  $t = 0$ .  
A. -1    B. 1    C. -3    D. 0    E. NOTA
- Which of the following statements is true of  $f(x) = -x^3 - 6x^2 - 9x - 2$ ?  
A.  $f$  is decreasing on  $(-3, -1)$     B.  $f$  is increasing on  $(-3, -1)$   
C.  $f$  is increasing on  $(-\infty, -3)$     D.  $f$  is increasing on  $(-2, \infty)$     E. NOTA
- Find the volume of the solid formed by revolving the region bounded by  $y = \sin x$  and  $y = 0$  in the interval  $[0, \pi]$  about the  $y$  axis.  
A.  $\pi^3$     B.  $\frac{1}{2}\pi^2$     C.  $2\pi^2$     D.  $\pi$     E. NOTA

7. Given  $f(x) = 8 - (7/x)$ , find all  $c$  in the interval  $(1, 7)$  such that

$$f'(c) = \frac{f(7) - f(1)}{7 - 1}.$$

- A.  $\sqrt{7}$     B. 4    C.  $\pm\sqrt{7}$     D.  $\frac{7}{8}$     E. NOTA

8. Find the values of  $x$  that give relative extrema for the function  $f(x) = (x+1)^2(x-2)$ .

- A. Relative maximum :  $x = -1$ ; Relative minimum :  $x = 1$   
B. Relative maxima:  $x = 1$ ; Relative minimum :  $x = -1$   
C. Relative minimum :  $x = 2$   
D. Relative maximum :  $x = -1$ ; Relative minimum :  $x = 2$   
E. NOTA

9. Find  $dy/dx$  for  $y = x^3\sqrt{x+1}$ .

- A.  $\frac{3x^2}{2\sqrt{x+1}}$     B.  $\frac{x^2(7x+6)}{2\sqrt{x+1}}$     C.  $3x^2\sqrt{x+1}$   
D.  $\frac{7x^3 + x^2}{2\sqrt{x+1}}$     E. NOTA

10. Find an equation for the tangent line to the parabola  $y^2 = -4x$  at the point  $(-4, 4)$ .

- A.  $2y - x = 4$     B.  $2x + y^2 - 4y + 8 = 0$     C.  $x + y = 4$   
D.  $x + 2y = 4$     E. NOTA

11. A solid is generated by revolving the region bounded by  $y = \sqrt{9-x^2}$  and  $y = 0$  about the  $y$ -axis. A hole, centered along the axis of revolution, is drilled through this solid so that one-third of the volume is removed. Find the diameter of the hole.

- A. 1.46    B. 1.3564    C.  $\frac{4}{3}$     D. 0.658    E. NOTA

12. Evaluate  $\int \arcsin t \, dt$ .

- A.  $\frac{1}{\sqrt{1-t^2}} + C$       B.  $-\arccos t + C$       C.  $t \arcsin t + \sqrt{1-t^2} + C$   
 D.  $t \arcsin t - \ln \sqrt{1-t^2} + C$       E. NOTA

13. The balance in an account triples in 20 years. Assuming that interest is compounded continuously, what is the annual percentage rate?

- A. 9.99%      B. 4.48%      C. 5.49%      D. 3.47%      E. NOTA

14. Find  $dy / dx$  if  $y = \sin(x + y)$ .

- A. 0      B.  $\frac{\cos(x+y)}{1-\cos(x+y)}$       C.  $\cos(x+y)$   
 D. 1      E. NOTA

15. Evaluate the integral :  $\int \frac{9x^2 - 9x + 9}{x^2 + 1} \, dx$ .

- A.  $9x - \frac{9}{2} \ln(x^2 + 1) + C$       B.  $9 - \frac{9}{2} \ln(x^2 + 1) + C$   
 C.  $9x - 9 \ln(x^2 + 1) + C$       D.  $9 - 9 \ln(x^2 + 1) + C$   
 E. NOTA

16. Given  $\lim_{x \rightarrow 2} (2x - 1) = 3$ . Find  $\delta$  such that  $|(2x - 1) - 3| < 0.01$

whenever  $0 < |x - 2| < \delta$ .

- A. 3      B. 0.05      C. 0.03      D. 0.005      E. NOTA

17. Evaluate  $\int \frac{x+3}{x^2+9} dx$ .

- A.  $\ln|x-3|+C$       B.  $\frac{1}{3}\arctan\frac{x}{3}+C$       C.  $\frac{1}{2}\ln(x^2+9)+\arctan\frac{x}{3}+C$   
D.  $\frac{1}{2}\ln(x^2+9)+\frac{1}{3}\arctan\frac{x}{3}+C$       E. NOTA

18. Which of the following functions has a horizontal asymptote at  $y = 2$ ?

- A.  $\frac{x-2}{3x-5} = y$       B.  $\frac{2x}{\sqrt{x-2}} = y$       C.  $\frac{2x^2-6x+1}{1+x^2} = y$       D.  $\frac{2x-1}{x^2+1} = y$       E) NOTA

19. Evaluate  $\int \sec^5 x \tan^3 x dx$ .

- A.  $\frac{1}{7}\sec^7 x - \frac{1}{5}\sec^5 x + C$       B.  $\frac{1}{24}\sec^6 x \tan^4 x + C$   
C.  $\frac{1}{4}\sec^4 x \tan x + C$       D.  $\frac{1}{8}\sec^8 x - \frac{1}{6}\sec^6 x + C$       E. NOTA

20. Find an equation of the tangent line to the graph of  $f(x) = \frac{(x-1)}{(x+1)}$

when  $x = 1$ .

- A.  $y = \frac{2}{(x+1)^2}(x-1)$       B.  $x-2y=1$       C.  $y-1 = \frac{1}{2}x$   
D.  $y = 2(x-1)$       E. NOTA

21. An object has a constant acceleration of  $-42 \text{ ft / sec}^2$ , an initial velocity of  $5 \text{ ft / sec}$ , and an initial position of  $9 \text{ ft}$ . Find the position function describing the motion of this object .
- A.  $s = -21t^2 + 14$       B.  $s = -42t^2 + 9$       C.  $s = -42t^2 + 5t + 9$   
D.  $s = -21t^2 + 5t + 9$       E. NOTA
22. Use Newton's Method to approximate the real zero of the function in the interval  $[-1,0]$ :  $f(x) = x^3 + x + 1$ . Use  $x_1 = -1$  and three iterations.
- A.  $-0.8355$       B.  $-0.679$       C.  $-0.484$       D.  $-0.232$       E. NOTA
23. Find the average value of  $f(x) = 3x^2 - 2$  on the interval  $[0,2]$ .
- A. 1      B. 5      C. 6      D. 2      E. NOTA
24. Given that  $f(x) = 4/x$ , choose the correct statement .
- A.  $f$  is concave up on the interval  $(-\infty,0)$ .  
B.  $f$  is concave down on the interval  $(-\infty,0)$ .  
C.  $f$  is concave up on the interval  $(-\infty,\infty)$ .  
D.  $f$  is concave down on the interval  $(0,\infty)$ .  
E. NOTA
25. Find all points of inflection of the function  $f(x) = x^4 - 6x^3$ .
- A.  $(0,0)$       B.  $(0,0)$  and  $(\frac{9}{2}, -\frac{2187}{16})$       C.  $(3,-81)$   
D.  $(0,0)$  and  $(3,-81)$       E. NOTA

26. Find  $y = f(x)$  if  $f''(x) = x^2$ ,  $f'(0) = 7$  and  $f(0) = 2$ .
- A.  $x^2 + 9$       B.  $\frac{1}{12}x^4 + 7x + 2$       C.  $x^2 + 7x + 2$   
D.  $x^4 + 84x + 24$       E. NOTA
27. Which statement is NOT true of the graph of  $f(x) = (x+3)(x-4)^2$ ?
- A.  $f$  has a relative minimum at  $(4, 0)$ .  
B.  $f$  has a point of inflection at  $(4, 0)$ .  
C.  $f$  has a relative maximum at  $\left(-\frac{2}{3}, \frac{1372}{27}\right)$ .  
D.  $f$  has an intercept at  $(4, 0)$ .  
E. NOTA
28. If  $\frac{\pi}{2} < \theta < \pi$  and  $\sin \theta = \frac{2}{3}$ , find  $\sin 2\theta$ .
- A.  $-\frac{4\sqrt{5}}{9}$       B.  $\frac{4}{3}$       C.  $\frac{4\sqrt{5}}{9}$       D.  $-\frac{4}{3}$       E. NOTA
29. Find  $\frac{dy}{dx}$  for  $2x^2 + xy + 3y^2 = 0$ .
- A.  $-\frac{4x+y}{x+6y}$       B.  $-\frac{4x+y}{6y}$       C.  $4x+y+6y$   
D.  $\frac{4x+6y}{-x}$       E. NOTA
30. Find the volume of the solid formed by revolving the region bounded by the graphs of  $f(x) = \frac{2}{3}\sqrt{36-x^2}$  and  $g(x) = \frac{2}{3}|x|$  about the  $x$ -axis.
- A.  $64\sqrt{2}\pi$       B.  $-32(8-5\sqrt{2})\pi$       C.  $64\sqrt{2}$       D.  $64\pi$       E. NOTA