

- 1) The value of  $\lim_{x \rightarrow 1} \frac{x-1}{x^4-1}$  is
- a) 0                      b) 2                      c) 4                      d)  $\frac{1}{8}$                       e) none of these
- 2) How close to 4 do we have to take  $x$  so that  $4x - 10$  is within 0.01 of 26?
- a)  $\frac{1}{40}$                       b)  $\frac{1}{400}$                       c)  $\frac{1}{200}$                       d)  $\frac{1}{2}$                       e) none of these
- 3) A particle moves along a straight line with equation of motion  $s = t^3 + 2t$  ( $t$  represents time and  $s$  represents distance). The smallest velocity is
- a)  $\frac{1}{2}$                       b) 2                      c)  $\frac{1}{3}$                       d)  $-\frac{1}{2}$                       e) none of these
- 4) The value of the limit:  $\lim_{t \rightarrow 0} \frac{\sin 6t}{\sin 4t}$  is
- a) 0                      b) 0.5                      c) 1                      d) 1.5                      e) none of these
- 5) A possible value of  $c$  in  $(ax + by = c, a > 0)$  the line equation tangent to the curve,  $y = \frac{8}{\sqrt{4+3x}}$  (at 4, 2) is
- a) 26                      b) 20                      c) 4                      d) 44                      e) none of these
- 6) If  $xy^3 + xy = 6$ , then state the value of  $y'(3, 1)$
- a) 0                      b)  $\frac{1}{3}$                       c)  $-\frac{1}{6}$                       d)  $-4$                       e) none of these
- 7) If  $y = x \sin x$ , then state the value of  $y''(0)$
- a)  $\sqrt{2}$                       b)  $\frac{\sqrt{2}}{2}$                       c)  $-\sqrt{3}$                       d)  $-2$                       e) none of these
- 8) The length of a rectangle is increasing at the rate of 2 feet per second and the width is increasing at the rate of 1 foot per second. When the length is 5 feet and the width is 3 feet, how fast is the area increasing?
- a) 5 ft<sup>2</sup>/sec                      b) 11 ft<sup>2</sup>/sec                      c) 6 ft<sup>2</sup>/sec                      d) 10 ft<sup>2</sup>/sec                      e) none of these
- 9) The decimal portion of the approximation for  $\sqrt{26}$  by using the differential ( $\Delta x = 1$ ) is
- a) 0.1                      b) 0.2                      c) 0.15                      d) 0.05                      e) none of these
- 10) The positive difference between the local maximum and local minimum values of the function  $f(x) = x^3 - 3x + 27$  is
- a) 4                      b) 1                      c) 9                      d) 2                      e) none of these

- 11) A definition of  $e$  is
- a)  $\lim_{n \rightarrow \infty} (1 - \frac{1}{n})^n$       b)  $\lim_{n \rightarrow 0} (1 - n)^{1/n}$       c)  $\lim_{n \rightarrow \infty} (n - \frac{1}{n})^n$       d)  $\lim_{n \rightarrow \infty} (\frac{n^2+1}{n})^n$       e) none of these
- 12) The value(s) for  $x$  that satisfy the mean value theorem for  $f(x) = \frac{x+2}{x-2}$  on the interval  $[0, 4]$  is (are)
- a) 1                              b) 2                              c)  $\frac{1}{2}$                               d)  $\frac{1}{2}, \frac{7}{2}$                               e) none of these
- 13) At what value of  $x$  does the function  $f(x) = x^2 - 2x$  change from decreasing to increasing?
- a) 1                              b) -1                              c)  $-\frac{1}{2}$                               d) 2                              e) none of these
- 14) What is the length of the largest interval on which the function  $f(x) = x^3 - 3x^2 - 9x$  is decreasing?
- a)  $3\sqrt{2}$                               b) 1                              c) 4                              d)  $2\sqrt{2}$                               e) none of these
- 15) How many inflection points does the function  $f(x) = x^8 - x^2$  have?
- a) 1                              b) 0                              c) 4                              d) 2                              e) none of these
- 16)  $\lim_{x \rightarrow \infty} \frac{\sin^3 x}{x} =$
- a)  $-\frac{1}{3}$                               b) 0                              c)  $\frac{1}{3}$                               d)  $-\frac{\sqrt{2}}{2}$                               e) none of these
- 17) A cardboard box of volume of  $32 \text{ in}^3$  with a square base and open top is to be constructed. Find the minimum area of cardboard needed (neglecting waste) to construct the box.
- a)  $54 \text{ in}^2$                               b)  $48 \text{ in}^2$                               c)  $46 \text{ in}^2$                               d)  $-36 \text{ in}^2$                               e) none of these
- 18)  $C(x) = 25 + 4x + 18x^{-1}$  is the total cost of producing  $x$  widgets. State the marginal cost (the derivative) when  $x = 10$ .
- a) \$3.72                              b) \$3.75                              c) \$3.79                              d) \$3.89                              e) none of these
- 19) The cost of operating a bus is  $C(x) = 200 + 8x$  where  $x$  is the number of passengers. If a ticket cost is \$40 then there will be 10 passengers and if the ticket cost is \$35, there will be 15 passengers. Assuming the demand (ticket price) function is linear, then what should the price of a ticket be to maximize the profit?
- a) \$37                              b) \$27                              c) \$29                              d) \$31                              e) none of these
- 20) The second approximation,  $x_2$ , to a root of the equation  $x^5 - 34 = 0$  by using Newton's method with the first approximation  $x_1 = 2$  is  $x_2 =$
- a)  $\frac{79}{40}$                               b)  $\frac{81}{40}$                               c)  $\frac{77}{40}$                               d)  $\frac{161}{80}$                               e) none of these

- 21) If  $f''(x) = 1$ ,  $f'(0) = 7$ , and  $f(0) = 3$ , then the value of  $f(1)$  is
- a)  $\frac{10}{3}$                       b)  $\frac{17}{3}$                       c)  $\frac{7}{2}$                       d)  $\frac{17}{2}$                       e) none of these
- 22) The estimate of the area under the graph of  $f(x) = x^2$  using four equal width approximating rectangles and right endpoints on the interval  $[0, 2]$  is
- a)  $\frac{1}{2}$  units<sup>2</sup>                      b)  $\frac{7}{4}$  units<sup>2</sup>                      c)  $\frac{15}{4}$  units<sup>2</sup>                      d)  $\frac{29}{8}$  units<sup>2</sup>                      e) none of these
- 23) If  $f(x) = \int_0^{x^2} t^4 dt$ , then  $f'(x)$  is
- a)  $x^2$                       b)  $x^4$                       c)  $2x^6$                       d)  $2x^9$                       e) none of these
- 24) The value of  $\int_0^{\pi/3} \sec x \tan x (1 + \sec x) dx$  is
- a) 4                      b)  $\frac{5}{2}$                       c) 3                      d)  $\frac{11}{2}$                       e) none of these
- 25) The volume obtained by rotating the region bounded by the graphs of  $y = 2 - x^2$  and  $y = 1$  about the  $x$ -axis is
- a)  $\frac{\pi}{15}$  units<sup>2</sup>                      b)  $2 - \pi^2$  units<sup>2</sup>                      c)  $15\pi$  units<sup>2</sup>                      d)  $\frac{56\pi}{15}$  units<sup>2</sup>                      e) none of these

