165testthreesample2009

1. Suppose $1,500 is invested at an annual interest rate of 8 percent compounded quarterly. Compute the balance after 12 years.
   A) $3,780.61
   B) $3,820.61
   C) $3,880.61
   D) $3,890.61

2. How much money should be invested today at an annual interest rate of 9% compounded continuously so that 30 years from now it will be worth $27,000?
   A) $ 24,676.14
   B) $ 2,035.02
   C) $ 401,752.76
   D) $ 1,814.55

3. A radioactive substance decays exponentially. If 800 grams were present initially and 600 grams are present 100 years later, how many grams will be present after 400 years?
   A) 251.93 grams
   B) 251.97 grams
   C) 252.01 grams
   D) 253.13 grams

4. Solve the given equation for x. $-8=-9+9e^{-2x}$
   A) $-2e^{9}$
   B) $\dfrac{e^{9}}{-2}$
   C) $\dfrac{\ln 9}{-2}$
   D) $\dfrac{\ln 9}{2}$

5. A radioactive substance decays exponentially. If 700 grams were present initially and 200 grams are present 100 years later, how many grams will be present after 400 years?
   A) 4.66 grams
   B) 0 grams
   C) 3.41 grams
   D) 2.16

6. The equation of the tangent line to $f(x)=e^{x^2}$ at $x = 2$ is
   A) $y=4e^{4x}$
   B) $y=3e^4x$
   C) $y=3e^4$
   D) $y=4e^4x-7e^4$

7. Find $\frac{dy}{dx}$, where $y=20-5e^{-0.03x}$.
   A) $-5e^{-0.03x}$
   B) $0.15e^{-0.03x}$
   C) $-0.15e^{-0.03x}$
   D) $5e^{-0.03x}$

8. A manufacturer can produce radios at a cost of $10 apiece and estimates that if they are sold for x dollars apiece, consumers will buy approximately $200e^{-0.2x}$ radios per month. The price at which the manufacturer should sell the radios to maximize the profit is
   A) $10
   B) $15
   C) $18
   D) $20

9. The consumer demand for a certain commodity is $D(p)=5,000e^{-0.03p}$ units per month when the market price is p dollars per unit. Determine the market price that will result in the greatest consumer expenditure.
   A) $30.31
   B) $31.31
   C) $33.33
   D) $34.33

10. Find the derivative of $\ln\left[\left(\ln x^2\right)^5\right]$.

A) $\frac{7}{x\ln x}$

B) $\frac{14}{x\ln x}$

C) $\frac{14}{x+\ln x}$

D) $\frac{14}{\ln(\ln x)}$

11. The equation of the tangent line to $f(x)=e^{x^5}$ at $x = 6$ is

A) $y=6,480e^{7,776}x-38,879e^{7,776}$

B) $y=7,776e^{7,776x}$

C) $y=7,776e^{7,776}$

D) $y=6,480e^{7,776}x+38,881e^{7,776}$

12. Find the critical numbers for $f(x)=8x^3e^{8x}$.

A) $0, e$

B) $8, \frac{8}{3}$

C) $0, -\frac{3}{8}$

D) $0, -\frac{3}{8}, 8$

13. Evaluate $\int(5x^3-3x+4)\,dx$.

A) $\frac{5x^4}{4}-\frac{3x^2}{2}+4x+C$

B) $15x^2-3+C$

C) $5x^4-3x^2+4x+C$

D) $\frac{5x^4}{4}-\frac{3x^2}{2}+C$

14. Find the function whose tangent line has the slope $3x^2+1$ for each value of x and whose graph passes through (0, 2).
    A) x^3+x+2
    B) x^3+x
    C) x^3+x-2
    D) x^3+3

15. A study indicates that x months from now the population of a certain city will be increasing at the rate of $(3+4x)x^{-1/2}$ people per month. By how much will the population increase over the next 9 months?
    A) 70 people
    B) 80 people
    C) 90 people
    D) 100 people

16. A manufacturer makes a certain product at a rate of t^2-3t+5 items per hour. How many items does the company make on average during the second hour?
    A) 2.83
    B) 11.83
    C) 4.83
    D) 10.83

17. Evaluate $\int 9x^7-7x+8\,dx$
    A) $\frac{9x^8}{8}-\frac{7x^2}{2}+8x+C$
    B) $63x^6-7+C$
    C) $9x^8 - 7x^2 + 8x + C$
    D) $\frac{9x^8}{8}-\frac{7x^2}{2}+C$

18. Specify the substitution you would choose to evaluate the integrals.

    $\int \sqrt{4-2t}\,dt$

    A) $u = t$
    B) $u = 4-2t$
    C) $u = 2t$
    D) $u = \sqrt{4-2t}$

19. Evaluate $\int e^{3x-2}\,dx$

A) $e^{3x-2}+C$

B) $(3x-2)e^{3x-2}+C$

C) $(3x-2)Ce^{3x-2}$

D) $\dfrac{e^{3x-2}}{3}+C$

20. Evaluate $\int \dfrac{1}{4x}\,dx$

A) $\dfrac{\ln|x|}{4}+C$

B) $\ln|x|+C$

C) $-\dfrac{2}{4x^2}+C$

D) $\dfrac{4}{(4x)^2}+C$

21. In a certain section of the country, the price of chicken is currently \$3 per kilogram. It is estimated that x weeks from now the price will be increasing at a rate of $3\sqrt{x+1}$ cents per kilogram, per week. How much will chicken cost 5 weeks from now?

A) \$3.27

B) \$0.28

C) \$4.27

D) \$2.28

22. Water flows into a tank at the rate of $\sqrt{8t+9}$ ft ^{3} /min. If the tank is empty when $t = 0$, how much water does it contain 8 minutes later? Express the answer to two decimal places.

A) 0.46

B) 49.73

C) 404.71

D) 68.35

23. Evaluate $\int x\sqrt{x^2+9}dx$

A) $\frac{(x^2+9)^{3/2}}{3}+C$

B) $(x^2+9)^{3/2}+C$

C) $\frac{x^3}{3}+9x+C$

D) $\frac{3(x^2+9)^{3/2}}{4}+C$

24. Evaluate $\int_{-1}^{3}(3x-5)^4\,dx$. Express your answer as a decimal. Approximate to one decimal place.

A) 2,250.2

B) 2,251.6

C) 2,252.8

D) 2,253.4

25. Use the fundamental theorem of calculus to find the area of the region under the line $y = 6x + 9$ above the interval $1 \le x \le 4$.

A) 96

B) 90

C) 72

D) 70

26. Suppose the marginal cost is $C'(x)=e^{-0.9x}$, where x is measured in units of 200 items and the cost is measured in units of \$6,000. Find the cost corresponding to the production interval [600, 800] .

A) \$239

B) \$215

C) \$266

D) \$210

27. Determine the area of the region bounded by the line $y = x$ and the curve $y=x^3$.

A) $\frac{1}{2}$

B) $\frac{5}{8}$

C) $\frac{3}{4}$

D) $\frac{7}{8}$

28. Determine the area between $f(x)=\sqrt{x}$ and $g(x)=x^3$ on the domain determined by the points where the graphs of the functions cross.
    A) 0.4355
    B) 0.4167
    C) 0.5563
    D) 0.7210

29. Sketch the region *R* and then use calculus to find the area of *R*. *R* is the region between the curve $y=x^3$ and the line $y = 20x$ for $x \geq 0$.
    A) 0
    B) 100
    C) 5
    D) 25

30. Find the consumers surplus for a commodity whose demand function is $D(q)=30e^{-0.03q}$ dollars per unit if the market price is $p_0=\$21$ per unit. (Hint: Find the quantity q_0 that corresponds to the given price $p_0 = D(q_0)$.)
    A) $49.53
    B) $49.81
    C) $50.33
    D) $53.41

31. Money is transferred continuously into an account at the constant rate of $1,400 per year. The account earns interest at the annual rate of 7% compounded continuously. How much will be in the account at the end of 2 years?
    A) $2,299.55
    B) $81,103
    C) $23,004.48
    D) $2,800

32. It is estimated that *t* days from now a farmer's crop will be increasing at the rate of $0.3t^2+0.6t+1$ bushels per day. By how much will the value of the crop increase during the next 7 days if the market price remains fixed at $2 per bushel?
    A) $98.00
    B) $112.00
    C) $122.00
    D) $28.00

33. Money is transferred continuously into an account at the constant rate of $1,200 per year. Assume the account earns interest at the annual rate of 3% compounded continuously. Compute the future value of the income stream over a 11 year period.
    A) $469.16
    B) $31,277.45
    C) $62,554.9
    D) $15,638.73

Answer Key

1. C
2. D
3. D
4. D
5. A
6. D
7. B
8. B
9. C
10. A
11. A
12. C
13. A
14. A
15. C
16. A
17. A
18. B
19. D
20. A
21. A
22. B
23. A
24. C
25. C
26. C
27. A
28. B
29. B
30. C
31. C
32. B
33. D