

Name: _____ Date: _____

1. If \$3,000 is invested at 10% compounded continuously, what is the balance after 9 years?
A) \$7,378.79
B) \$7,378.81
C) \$7,391.90
D) \$7,342.10

2. How much money should be invested today at an annual interest rate of 5% compounded continuously so that 40 years from now it will be worth \$14000?
A) \$ 13317.21
B) \$ 1988.64
C) \$ 103446.79
D) \$ 1894.69

3. At what interest rate, compounded continuously, should \$2500 be invested today so that 12 years from now the account will be worth \$5000.
A) 11.55%
B) 0.06%
C) 2.89%
D) 5.78%

4. A manufacturer of light bulbs estimates that the fraction $F(x)$ of bulbs that remain burning after t weeks is given by $F(t) = e^{-kt}$, where k is a positive constant. Suppose twice as many bulbs are burning after 3 weeks as are burning after 10 weeks. Compute the fraction of the bulbs that remains burning after 28 weeks.
A) $\frac{1}{15}$
B) $\frac{1}{16}$
C) $\frac{1}{4}$
D) $\frac{1}{32}$

5. Find $f(3)$ if $f(x) = e^{kx}$ and $f(1) = 10$.
- A) 1000
B) 59049
C) $\frac{1}{59049}$
D) $\frac{1}{1000}$
6. The total number of hot dogs sold by a fast food chain is growing exponentially. If 2 billion have been sold by 1998 and 5 billion by 2000, how many will be sold in the year 2010?
7. True or false: A sum of money, A_0 , is invested at a certain fixed interest rate, and this interest is compounded continuously. After 7 years, the money has doubled. The balance at the end of 14 years is $4A_0$.
8. True or false: If $f(x) = 20 - Ae^{kx}$, $f(0) = 5$, and $f(2) = 3$, then $f(4) = 0.7333$.
9. True or false: A sum of money, A_0 , is invested at a certain fixed interest rate, and this interest is compounded continuously. After 6 years, the money has doubled. The balance at the end of 12 years is $2A_0$.
10. 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

11. Solve for x : $a^{2x-1} = b$

A) $x = \frac{\ln b}{2 \ln a}$

B) $x = \frac{1 + (\ln b / \ln a)}{2}$

C) $x = \left(1 + \frac{\ln b}{\ln a}\right)^2$

D) $x = 1 + \frac{\ln b}{2 \ln a}$

12. Solve for x : $2 \ln x - \frac{1}{3} \ln x^2 = 4$

A) $x = e$

B) $x = e^3$

C) $x = e^4$

D) $x = e^2$

13. The fraction of television sets manufactured by a certain company that are still in working condition after t years of use is approximately $f(t) = e^{-0.25t}$. What fraction can be expected to fail before 2 years of use?

A) 0.61

B) 1.65

C) 0.39

D) 0.92

14. The equation of the tangent line to $f(x) = xe^x$ at $x = 1$ is

15. Find $\frac{df(x)}{dx}$, where $f(x) = x^3e^{-3x}$.

16. 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) $y = 4e^4x - 7e^4$

17. Find $\frac{df(x)}{dx}$, where $f(x) = \ln x^5$.
- A) $\frac{5}{x}$
B) $5x$
C) $\frac{x}{5}$
D) $\frac{1}{5x}$
18. 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 the manufacturer should sell the radios to maximize the profit is
- A) \$10
B) \$15
C) \$18
D) \$20
19. A manufacturer estimates that when x units of a particular commodity are produced, the total cost will be $C(x) = 190 + 36\ln(6x - 3)$ dollars. Use marginal cost analysis to estimate the cost of producing the 14th unit.
- A) \$345.43
B) \$348.2
C) \$2.88
D) \$3.13
20. Find $\frac{df(x)}{dx}$, where $f(x) = e^{-8x}$.
- A) $x = -8e^{-8x}$
B) $x = -8xe^{-8x}$
C) $x = e^{-8x}$
D) $x = -8e^{-8x-1}$
21. Money is deposited in a bank that offers interest at 7 percent compounded continuously. Find the percentage rate of change of the balance with respect to time, as a percent.
22. Money is deposited in a bank that offers interest at 12 percent compounded continuously. Find the percentage rate of change of the balance with respect to time.

23. True or false: If $f(x) = e^{-3/(x+1)}$, then $\frac{df(x)}{dx} = e^{-3/(x+1)}$.
24. True or false: If $f(x) = x^x$, then $\frac{df(x)}{dx} = x^x \ln x$.
25. Let $f(x) = 4x^4 - 80 \ln x$, for $x > 0$. Find the minimum value of f for $x > 0$.
- A) $2(5^4 - 20 \ln(5))$
 - B) $4(5^4 - 20 \ln(5))$
 - C) 0
 - D) $20(1 - \ln(5))$
26. True or false: The function $f(x) = e^x$ is increasing everywhere.
27. True or false: The function $y = \ln 2x$ is concave downward everywhere.
28. True or false: The function $y = e^{2x}$ is increasing everywhere.

Answer Key

1. B
2. D
3. D
4. B
5. A
6. 488.3 billion
7. True
8. True
9. False
10. D
11. B
12. B
13. C
14. $y = 2 * e * x - e$
15. $e^{(-3 * x)} * (3 * x^2 - 3 * x^3)$
16. D
17. A
18. B
19. C
20. A
21. 7
22. 12 percent
23. False
24. False
25. D
26. True
27. True
28. True