1. Recently, a certain bank offered a 10-year CD that earns 2.29% compounded continuously.

Use the given information to answer the questions.

(a) If $20,000 is invested in this CD, how much will it be worth in 10 years?

approximately $\square$ (Round to the nearest cent.)

(b) How long will it take for the account to be worth $70,000?

approximately \square years (Round to two decimal places as needed.)

2. **Present value.** A promissory note will pay $40,000 at maturity 7 years from now. How much should you be willing to pay for the note now if money is worth 3.5% compounded continuously?

$\square$ (Round to the nearest dollar.)

3. How many years are required for an investment to double in value if it is appreciating at the rate of 2% compounded continuously?

At 2% compounded continuously, the investment doubles in \square years.
(Round to one decimal place as needed.)

4. At what nominal rate compounded continuously must money be invested to triple in 8 years?

A rate of \square% is required for money to triple in 8 years.
(Do not round until the final answer. Then round to the nearest tenth.)

5. Find \( f'(x) \).

\[ f(x) = 4e^x + 3x - \ln x \]

\[ f'(x) = \square \]

6. Find the equation of the line tangent to the graph of \( f \) at the indicated value of \( x \).

\[ f(x) = 3e^x + 2x; \ x = 0 \]

\( y = \square \) (Type your answer in slope-intercept form.)
7. Find the equation of the line tangent to the graph of \( f \) at the indicated value of \( x \).

\[ f(x) = \ln x^8; \quad x = e^3 \]

\[ y = \square \] (Type your answer in slope-intercept form. Type an exact answer.)

8. Look at the graph of \( f(x) = 5 \ln x \) with tangent line at \( x = 2 \). Then answer the questions.

Does the line pass through the origin?

○ Yes
○ No
○ Cannot be determined

Will the line tangent at \( x = 3 \) pass through the origin?

○ Yes
○ No

9. First use the appropriate properties of logarithms to rewrite \( f(x) \), and then find \( f'(x) \).

\[ f(x) = 24x + \ln 24x \]

Rewrite \( f(x) \) using properties of logarithms.

\[ f(x) = \square \] (Do not simplify.)

Find \( f'(x) \).

\[ f'(x) = \square \] (Simplify your answer.)
10. First use appropriate properties of logarithms to rewrite \( f(x) \), and then find \( f'(x) \).

\[
f(x) = 4 \ln \left( \frac{8}{x} \right)
\]

\[
f'(x) = \square \quad \text{(Simplify your answer.)}
\]

11. Find \( \frac{dy}{dx} \).

\[
y = 5 \ln x + 6 \log_5 x
\]

\[
\frac{dy}{dx} = \square \quad \text{(Type an exact answer in simplified form.)}
\]

12. Find \( \frac{dy}{dx} \) for the indicated function \( y \).

\[
y = 7^x + e^8
\]

\[
\frac{dy}{dx} = \square \quad \text{(Simplify your answer. Do not evaluate.)}
\]

13. The salvage value \( S \) (in dollars) of a company jet after \( t \) years is estimated to be given by the formula below. Use the formula to answer the questions.

\[
S(t) = 500,000(0.8)^t
\]

What is the rate of depreciation (in dollars per year) after 1 year?

\[
S \square \text{ per year}
\]

(Do not round until the final answer. Then round to the nearest cent as needed.)

What is the rate of depreciation (in dollars per year) after 5 years?

\[
S \square \text{ per year}
\]

(Do not round until the final answer. Then round to the nearest cent as needed.)

What is the rate of depreciation (in dollars per year) after 10 years?

\[
S \square \text{ per year}
\]

(Do not round until the final answer. Then round to the nearest cent as needed.)
14. Find \(f'(x)\).

\[
\begin{align*}
\quad f(x) &= 6x^5 (x^4 - 5) \\
\quad f'(x) &= \blacksquare
\end{align*}
\]

15. Find \(f'(x)\).

\[
\begin{align*}
\quad f(x) &= \frac{9x - 8}{3x + 1} \\
\quad f'(x) &= \blacksquare
\end{align*}
\]

16. Find \(f'(x)\).

\[
\begin{align*}
\quad f(x) &= 3x^3 \ln x \\
\quad f'(x) &= \blacksquare
\end{align*}
\]

17. Use the product rule to find the derivative.

\[
\begin{align*}
\quad y &= (3x^2 + 2)(2x - 3) \\
\quad y' &= \blacksquare
\end{align*}
\]

18. Find \(f'(x)\).

\[
\begin{align*}
\quad f(x) &= \frac{x^2 + 8}{7x - 1} \\
\quad f'(x) &= \blacksquare
\end{align*}
\]
19. Find \( h'(x) \) where \( f(x) \) is an unspecified differentiable function.

\[
h(x) = \frac{f(x)}{x^6}
\]

Choose the correct answer below.

- **A.** \( h'(x) = \frac{f'(x)}{6x^5} \)
- **B.** \( h'(x) = \frac{xf'(x) - 6f(x)}{x^7} \)
- **C.** \( h'(x) = \frac{6f(x) - xf'(x)}{x^{12}} \)
- **D.** \( h'(x) = \frac{6f'(x)}{x^{12}} \)

20. Find the indicated derivative and simplify.

For \( y = (9 + 2x - 9x^2) e^x \)

\[ y' = \]

21. Find \( f'(x) \) and find the equation of the line tangent to the graph of \( f \) at \( x = 1 \).

\( f(x) = (1 + 5x)(3 - 2x) \)

\( f'(x) = \)

\( y = \) (Type your answer in slope-intercept form.)
22. Find $f'(x)$ and find the equation of the line tangent to the graph of $f$ at $x = 3$.

$$f(x) = \frac{5x}{2^x}$$

$f'(x) =$

Find the equation of the line tangent to the graph at $x = 3$.

$y =$

23. Find $f'(x)$ and find the values(s) of $x$ where $f'(x) = 0$.

$$f(x) = (2x - 9)(x^2 + 6)$$

$f'(x) =$

$x =$

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

24. Find the indicated derivative and simplify.

$$\frac{dy}{dx} \text{ for } y = 64x^8(x^8 + 8)$$

$$\frac{dy}{dx} =$

25. Find the indicated derivative and simplify.

$$y' \text{ for } y = \log \frac{5x}{3 + x^5}$$

$y' =$

26. Find the indicated derivative and simplify.

$$f'(x) \text{ for } f(x) = \frac{9\sqrt[3]{x}}{x^2 - 7}$$

$f'(x) =$
27. Find the indicated derivative and simplify.

\[
\frac{d}{dx} \left[ \frac{2x^3 - 9x^2}{\sqrt[3]{x^2}} \right] = \square
\]
28. The total sales of $S$ (in thousands of DVD's) of a certain movie are given by the following formula where $t$ is the number of months since the release of the DVD. Use the formula to answer the questions.

$$S(t) = \frac{90t^2}{t^2 + 150}$$

a) Find $S'(t)$.

$$S'(t) = \square$$

b) Find $S(15)$ and $S'(15)$.

The value of $S(15)$ rounded to the nearest hundredth is $\square$.

The value of $S'(15)$ rounded to the nearest hundredth is $\square$.

What do the values $S(15) = 54$ and $S'(15) = 2.88$ indicate?

- [ ] A. After 15 months, the total sales are 54,000 DVD's and the sales are increasing at the rate of 2880 DVD's per month.
- [ ] B. After 15 months, the total sales are 2880 DVD's and the sales are increasing at the rate of 54 DVD's per month.
- [ ] C. After 15 months, the total sales are 54,000 DVD's and the sales are increasing at the rate of 2.88 DVD's per month.
- [ ] D. After 15 months, the total sales are 28,800 DVD's and the sales are increasing at the rate of 5400 DVD's per month.

c) Use the results from part (b) to estimate the total sales after 16 months.

After 16 months, the total sales will be approximately how many DVD's?

$\square$ (Round to the nearest whole number.)
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| 1. | 25146.84  
    | 54.71   |
| 2. | 31308       |
| 3. | 34.7        |
| 4. | 13.7        |
| 5. | \[4e^x + 3 - \frac{1}{x}\] |
| 6. | 5x + 3       |
| 7. | \[\frac{8}{e^x} + 16\] |
| 8. | No           
    | No           |
| 9. | \[24x + \ln 24 + \ln x\]  
    | \[24 + \frac{1}{x}\] |
| 10.| \[-\frac{4}{x}\]   |
| 11.| \[\frac{5}{x} + \frac{6}{x \ln 5}\] |
| 12.| \[7^x \ln 7\]   |
| 13.| \[-89,257.42\]  
    | \[-36,559.84\]  
    | \[-11,979.93\]  |

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14. $54x^8 - 150x^4$

15. $\frac{33}{(3x + 1)^2}$

16. $3x^2 + 9x^2 \ln x$

17. $18x^2 - 18x + 4$

18. $\frac{7x^2 - 2x - 56}{(7x - 1)^2}$

19. B

20. $e^x(11 - 16x - 9x^2)$

21. $13 - 20x$
$- 7x + 13$

22. $\frac{5 - 5x \ln 2}{2^x}$
$\frac{5 - 15 \ln 2}{8}x^2 + \frac{45 \ln 2}{8}$

23. $6x^2 - 18x + 12$
$2, 1$

24. $\frac{520x^8 + 64}{x^8}$

25. $\frac{3 + x^5 - 5x^3 \ln x}{(3 + x^2)^2 x \ln 5}$
26. \[ \frac{-15x^2 - 21}{2x^3 (x^2 - 7)^2} \]

27. \[ \frac{14}{3} \cdot \frac{4}{x^3} - \frac{1}{12x^{\frac{1}{3}}} \]

28. \[ \frac{27000t}{(t^2 + 150)^2} \]

54

2.88

A

56,880