**Differentiate.**

1) $y = e^{9x/2}$                                                                                1) _____

2) $f(x) = -4e^{2x}$                                                                         2) _____

3) $f(x) = 4 - e^{-x}$                                                                      3) _____

4) $f(x) = \frac{1}{7}e^{7x}$                                                                4) _____

5) $y = 4e^{x^2}$                                                                            5) _____

6) $y = e^{8x^2} + x$                                                                       6) _____

7) $y = 5x^2e^{3x}$                                                                         7) _____

8) $y = (x^2 - 2x + 4)\,e^x$                                                             8) _____

9) $y = \dfrac{e^{-x} + 1}{e^x}$                                                         9) _____

**Find the indicated tangent line.**

10) Find the tangent line to the graph of $f(x) = e^{3x}$ at the point $(0, 1)$.                    10) _____

11) Find the tangent line to the graph of $f(x) = 6e^{-3x}$ at the point $(0, 6)$.                 11) _____

**Solve the problem.**

12) The sales in thousands of a new type of product are given by $S(t) = 40 - 40e^{-0.2t}$, where t          12) _____
represents time in years. Find the rate of change of sales at the time when $t = 7$.

**For the given function, find the requested relative extrema or extreme value.**

13) $y = 8e^x + 2e^{-x}$; relative extrema                                             13) _____

14) $y = 2xe^{-x}$; relative extrema                                                   14) _____

15) $y = xe^{7x}$; relative extrema                                                    15) _____

16) $y = 5e^x + xe^x$; relative extrema                                               16) _____

**Find the derivative of the function.**

17) $y = \ln 4x$                                                                             17) _____

1r

18) $y = \ln(x - 6)$

18) _____

19) $y = \ln 7x^2$

19) _____

20) $y = \ln(2 + x^2)$

20) _____

21) $y = \ln(4x^3 - x^2)$

21) _____

**Find the derivative.**

22) $y = e^x \ln x$

22) _____

23) $y = \dfrac{e^x}{\ln x}$

23) _____

**Differentiate.**

24) $y = 6^x$

24) _____

25) $f(x) = 210^x$

25) _____

26) $y = 10^{11x}$

26) _____

27) $y = 21^{-x}$

27) _____

**Find all relative maxima or minima.**

28) $y = \ln x - x$

28) _____

**Solve the problem.**

29) The sales in thousands of a new type of product are given by $S(t) = 120 - 60e^{-0.9t}$, where t represents time in years. Find the rate of change of sales at the time when $t = 4$.

29) _____

**For the given function, find the requested relative extrema or extreme value.**

30) $y = 2e^x + 7e^{-x}$; relative extrema

30) _____

31) $y = xe^{5x}$; relative extrema

31) _____

32) $y = 6e^x + xe^x$; relative extrema

32) _____

**Solve the problem.**

33) The population of a particular city (in thousands) can be modeled by the function

$$P(t) = \frac{500}{1 + 20e^{-0.05x}},$$

where x is the number of years after 1920.  In what year was the growth rate of the population the fastest?

33) _____

1) $\frac{9}{2}e^{9x/2}$

2) $-8e^{2x}$

3) $e^{-x}$

4) $e^{7x}$

5) $8xe^{x^2}$

6) $16xe^{8x^2 + 1}$

7) $5xe^{3x}(3x + 2)$

8) $(x^2 + 2)\,e^x$

9) $\frac{-e^x - 2}{e^{2x}}$

10) $y = 3x + 1$

11) $y = -18x + 6$

12) 2.0 thousand per year

13) $(-0.69, 8.00)$, relative minimum

14) $(1, 2/e)$, relative maximum

15) $(-1/7, -1/(7e))$, relative minimum

16) $(-6, -e^{-6})$, relative minimum

17) $\frac{1}{x}$

18) $\frac{1}{x - 6}$

19) $\frac{2}{x}$

20) $\frac{2x}{x^2 + 2}$

21) $\frac{12x - 2}{4x^2 - x}$

22) $\frac{e^x(x \ln x + 1)}{x}$

23) $\frac{x\,e^x \ln x - e^x}{x \ln^2 x}$

24) $(\ln 6)6^x$

25) $(\ln 210)210^x$

26) $11 \cdot (\ln 10) \cdot 10^{11x}$

27) $(-\ln 21)21^{-x}$

28) $(1, -1)$, relative maximum

29) 1.5 thousand per year

30) $(0.63, 7.48)$, relative minimum

31) $(-1/5, -1/(5e))$, relative minimum

32) $(-7, -e^{-7})$, relative minimum

33) 1980