

Name: _____ Class: _____

Honors Pre-Calculus Homework Packet: UNIT 3 Exponential and Logarithmic Functions

3.1 and 3.2

Determine whether the function represents exponential growth decay and find the percentage.

1. $P(t) = 4.3 \cdot 1.018^t$ 2. $f(x) = 5607 \cdot 0.9968^x$ 3. $g(t) = 43 \cdot 2^t$

Write an exponential function that represents the situation.

- Initial value: 52, Increasing at a rate of 2.3% per day.
- Initial value: 5, Decreasing at a rate of 50% per month.
- Initial value: 44, Tripling every 8 days.
- Initial mass: 15g, Decreasing at a rate of 4.6% six times an hour.
- Initial population: 2,319, Halving every 23 years.

Solve the following word problems.

- The population of River City in the year 1910 was 4200. The population increased 2.25% every year.
 - Find the population in 1930 and 1945
 - Predict when the population reached 20,000
- The Half-Life of a radioactive substance is 65 days. There are 3.5g initially.
 - Write the exponential function
 - How many days will it take for there to be 1g remaining?
- The number of students infected with the flu at Springfield High School after t days is modeled by the function $(t) = \frac{800}{1+49e^{-0.2t}}$.
 - What was the initial number of students infected with the flu?
 - How many days will it take for there to be 200 students infected?
 - School will close when 300 students have the flu. How many days will it this to happen?

3.3 and 3.4

Simplify the following logarithmic functions without a calculator

1. $\log 10,000$ 2. $\log 10^{-4}$ 3. $\log \frac{1}{10^{-12}}$ 4. $\ln e^3$ 5. $\ln \frac{1}{\sqrt{e^7}}$

6. $\log \frac{1}{10000000}$ 7. $\log \frac{1}{\sqrt[3]{10^5}}$

Describe the transformations of the functions from the basic functions $f(x) = \log x$ and $f(x) = \ln x$

8. $f(x) = \log(x - 3) - 1$ 9. $f(x) = -2 \ln(x) + 7$ (CONTINUED ON NEXT PAGE)

Expand each expression.

10. $\ln(9x)$ 11. $\log\left(\frac{2}{x}\right)$ 12. $\log(x^3y^2)$ 13. $\log(1000x^4)$ 14. $\log\left(\frac{800}{x}\right)$
15. $\ln\left(\frac{5x^2}{y}\right)$ 16. $\ln(2x^2y^4)^3$ 17. $\log\left(\frac{x^5}{y}\right)^2$ 18. $\ln(e^4x^{12}y^{16})$

Condense each expression.

19. $\log x + \log y$ 20. $\ln y - \ln 3$ 21. $\frac{1}{3}\log x$ 22. $2\ln x + 3\ln y + 9\ln z$
23. $5\log(x^3y^2)$ 24. $3\ln(x^3y) + 2\ln(xy^2)$ 25. $4\log(3x^2) + 2\log(2x^4) - 3\log(3x)$
-

3.5

Solve each exponential or logarithmic function algebraically.

1. $32\left(\frac{1}{4}\right)^{\frac{x}{3}} = 2$ 2. $3\left(4^{\frac{x}{2}}\right) = 96$ 3. $3\left(5^{-\frac{x}{4}}\right) = 15$ 4. $\log_2 x = 5$ 5. $\log_4(x - 5) = -1$
6. $0.98^x = 1.6$ 7. $80e^{0.045x} = 240$ 8. $7 - 3e^{-x} = 2$ 9. $3 - \log(x + 2) = 5$
10. $\frac{500}{1+25e^{0.3x}} = 200$ 11. $\ln(x + 3) + \ln(x + 4) = 3\ln 2$ 12. $\log(x - 2) + \log(x + 5) = 2\log 3$

13. A cup of coffee has cooled from 92°C to 50°C in 12 minutes in a room at 22°C . How long will it take for the coffee to cool to 30°C ?

14. A cake is removed from an oven at 350°F and cools to 120°F after 20 minutes in a room at 65°F . How long will it take for the cake to cool to 90°F ?

7.4

Decompose the following rational function. Do not solve for the numerators.

1. $\frac{x^5 - 2x^4 + x - 1}{x^3(x-1)^2(x^2+9)}$ 2. $\frac{x^4 + 3x^2 - 1}{(x^2+x+1)^3(x^2-x+1)}$

Find the partial fraction decomposition for each rational function. Solve for the numerators.

3. $\frac{-6}{x^2-3x}$ 4. $\frac{7x-7}{x^2-3x-10}$ 5. $\frac{4x-11}{2x^2-x-3}$ 6. $\frac{3x^2+4}{(x^2+1)^2}$ 7. $\frac{-6x+25}{x^3-6x^2+9x}$
8. $\frac{5x^2+7x-4}{x^3+4x^2}$ 9. $\frac{3x^3+6x-1}{(x^2+2)^2}$ 10. $\frac{x^2-x+2}{x^3-2x^2+x}$