HW 9-3
Secondary III

Name: Selected Answers
Date: _____ Class: _____

Solve the following equations graphically

1. $4e^{0.1x} = 60$

2. $120 = 75e^{3x}$

$x = 0.16$

3. $62 = 50e^{0.02x}$

Solve the following equations algebraically

4. $6^{3x-9} - 10 = -3$

$+10 \quad +10$

$6^{3x-9} = 7$

$\log_6 6^{3x-9} = \log_6 7$

$3x - 9 = \log_6(7) + 9$

$\frac{3x}{3} = \frac{\log_6(7)+9}{3}$

$x = \frac{\log_6(7)+9}{3} = 3.36$

5. $7e^{3x} = 42$

6. $11^{6x+2} = 12$

7. $5^{\frac{x}{4}} = 30$

$\log_5 5^{x/4} = \log_5 30$

$\frac{x}{4} = 4 \cdot \log_5(30)$

$x = 4 \cdot \log_5(30) = 8.45$

8. $3\ln(x-3) + 4 = 5$

$-4 \quad -4$

$\frac{3\ln(x-3)}{3} = \frac{1}{3}$

$e^{\ln(x-3)} = e^{1/3}$

$x - 3 = e^{1/3}$

$+3 \quad +3$

$x = e^{1/3} + 3 = 4.40$

9. $\ln x^2 = 4$

10. $\log_4(x-5) = -1$

11. The price P of a gallon of gas after t years is given by the equation $P = P_0(1 + r)^t$ where P_0 is the initial price of gas and r is the rate of inflation. If the price of a gallon of gas is currently \$3.25, how long will it take for the price to rise to \$4.00 if the rate of inflation is 10.5%?

12. A veterinarian has instructed Harrison to give his dog one 325-mg aspirin tablet for arthritis. The amount of aspirin, A, remaining in the dog's body after t minutes can be expressed by $A = 325\left(\frac{1}{2}\right)^{\frac{t}{16}}$. How long will it take for the amount of aspirin to drop to 50-mg?

amount

$\frac{50}{325} = \frac{325(1/2)^{t/16}}{325}$

$\log_{(1/2)}\frac{50}{325} = \log_{1/2}\left(\frac{1}{2}\right)^{t/16} \rightarrow 16\cdot\log_{1/2}\left(\frac{50}{325}\right) = t/16 \cdot 16$ $\quad t = 16\cdot\log_{1/2}\left(\frac{50}{325}\right) = 43.2$ hrs

13. How long will it take for a $150 initial investment in an account that pays 3.8% compounded continuously to grow to $1,500?

14. **Match the equations with the solutions.** Hints:

a. $9e^{3x} = 27$	____	$x \approx 1.099$
b. $9e^{x} = 27$	____	$x \approx 0.341$
c. $9e^{3x-4} = 27$	A	$x \approx 0.366$
d. $9e^{3x} + 2 = 27$	C	$x \approx 1.700$

a) $\frac{9e^{3x}}{9} = \frac{27}{9}$ $\quad \ln e^{3x} = \ln 3$ $\quad \frac{3x}{3} = \frac{\ln(3)}{3}$ $\quad x = \frac{\ln(3)}{3} =$

c) $\frac{9e^{3x-4}}{9} = \frac{27}{9}$ $\quad \ln e^{3x-4} = \ln(3)$ $\quad 3x - 4 = \ln(3)$ $\quad +4 \quad +4$ $\quad \frac{3x}{3} = \frac{\ln(3)+4}{3} =$

Review

1. The population of Smallville in the year 1890 was 6,250. Assume the population increased at a rate of 2.75% per year.

   a. Find the population in 1915.

   b. Find the population in 1940.