Math 098 Worksheet 8.6C_Exponential&LogarithmicApplicaions_v02
NO BOOK/ NO NOTES/YES CALCUATOR
Fall 2017 Dressler

Name___________________________________

Solve the problem.

1) Find out how long it takes a \$3300 investment to double if it is invested at 7% compounded semiannually. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

2) Find out how long it takes a \$2900 investment to double if it is invested at 8% compounded quarterly. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

3) Find out how long it takes a \$3300 investment to earn \$300 interest if it is invested at 9% compounded monthly. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

4) Find out how long it takes a \$3400 investment to earn \$300 interest if it is invested at 9% compounded semiannually. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

5) The value V of a car that is t years old can be modeled by $V(t) = 19{,}514(0.84)^t$. According to the model, when will the car be worth \$6000?

6) The value V of a car that is t years old can be modeled by $V(t) = 19{,}687(0.84)^t$. According to the model, when will the car be worth \$6000?

7) Newton's Law of Cooling states that the temperature of a heated object decreases exponentially over time toward the temperature of the surrounding medium. Suppose that a coffee is served at a temperature of 149°F and placed in a room whose temperature is 70°F. The temperature μ (in °F) of the coffee at time t (in minutes) can be modeled by $\mu(t) = 70 + 79e^{-0.06t}$. When will the temperature be 105°F?

8) Newton's Law of Cooling states that the temperature of a heated object decreases exponentially over time toward the temperature of the surrounding medium. Suppose that a coffee is served at a temperature of 130°F and placed in a room whose temperature is 70°F. The temperature μ (in °F) of the coffee at time t (in minutes) can be modeled by $\mu(t) = 70 + 60e^{-0.05t}$. When will the temperature be 105°F?

Solve.

9) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0 e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 10% per year. Express $P(t)$ in terms of P_0 and 0.1.

10) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0 e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 8% per year. Express $P(t)$ in terms of P_0 and 0.08.

11) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0 e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 5% per year. Express $P(t)$ in terms of P_0 and 0.05.

12) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0 e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 2% per year. Express $P(t)$ in terms of P_0 and 0.02.

13) In 1998, the population of Country C was 22 million, and the exponential growth rate was 1% per year. Find the exponential growth function.

14) In 1998, the population of Country C was 30 million, and the exponential growth rate was 1% per year. Find the exponential growth function.

15) In 1998, the population of a given country was 38 million, and the exponential growth rate was 4% per year. Find the exponential growth function.

16) In 1998, the population of a given country was 28 million, and the exponential growth rate was 2% per year. Find the exponential growth function.

17) How long will it take for the population of a certain country to double if its annual growth rate is 1.3%? (Round to the nearest year.)

18) How long will it take for the population of a certain country to double if its annual growth rate is 1%? (Round to the nearest year.)

19) How long will it take for the population of a certain country to triple if its annual growth rate is 5.6%? (Round to the nearest year.)

20) How long will it take for the population of a certain country to triple if its annual growth rate is 5.5%? (Round to the nearest year.)

21) There are currently 76 million cars in a certain country, decreasing by 6.8% annually. How many years will it take for this country to have 64 million cars? (Round to the nearest year.)

22) There are currently 78 million cars in a certain country, decreasing by 2% annually. How many years will it take for this country to have 64 million cars? (Round to the nearest year.)

23) Find out how long it takes a \$2700 investment to earn \$500 interest if it is invested at 8% compounded semiannually. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

24) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 3% per year. Express $P(t)$ in terms of P_0 and 0.03.

25) In 1998, the population of a given country was 27 million, and the exponential growth rate was 5% per year. Find the exponential growth function.

26) How long will it take for the population of a certain country to triple if its annual growth rate is 7.7%? (Round to the nearest year.)

27) There are currently 69 million cars in a certain country, decreasing by 2.3% annually. How many years will it take for this country to have 63 million cars? (Round to the nearest year.)

28) There are currently 54 million cars in a certain country, decreasing by 1.7% annually. How many years will it take for this country to have 47 million cars? (Round to the nearest year.)

29) Find out how long it takes a \$2500 investment to earn \$400 interest if it is invested at 8% compounded quarterly. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

30) When interest is compounded continuously, the balance in an account after t years is given by $P(t) = P_0e^{kt}$, where P_0 is the initial investment and k is the interest rate. Suppose that P_0 is invested in a savings account where interest is compounded continuously at 4% per year. Express $P(t)$ in terms of P_0 and 0.04.

31) In 1998, the population of a given country was 26 million, and the exponential growth rate was 3% per year. Find the exponential growth function.

Solve the problem.

32) Use the formula $N = Ie^{kt}$, where N is the number of items in terms of the initial population I, at time t, and k is the growth constant equal to the percent of growth per unit of time. A certain radioactive isotope has a half–life of approximately 1000 years. How many years would be required for a given amount of this isotope to decay to 75% of that amount?

33) Use the formula $N = Ie^{kt}$, where N is the number of items in terms of the initial population I, at time t, and k is the growth constant equal to the percent of growth per unit of time. An artifact is discovered at a certain site. If it has 74% of the carbon–14 it originally contained, what is the approximate age of the artifact? (carbon–14 decays at the rate of 0.0125% annually.)

34) Use the formula $N = Ie^{kt}$, where N is the number of items in terms of the initial population I, at time t, and k is the growth constant equal to the percent of growth per unit of time. A certain radioactive isotope decays at a rate of 0.15% annually. Determine the half–life of this isotope, to the nearest year.

35) Use the formula $N = Ie^{kt}$, where N is the number of items in terms of the initial population I, at time t, and k is the growth constant equal to the percent of growth per unit of time. There are currently 80 million cars in a certain country, decreasing by 4.5% annually. How many years will it take for this country to have 65 million cars? Round to the nearest year.

36) The amount of particulate matter left in solution during a filtering process is given by the equation $P = 300(2)^{-0.8n}$, where n is the number of filtering steps. Find the amounts left for $n = 0$ and $n = 5$. (Round to the nearest whole number.)

37) The amount of particulate matter left in solution during a filtering process is given by the equation $P = 900(2)^{-0.8n}$, where n is the number of filtering steps. Find the amounts left for $n = 0$ and $n = 5$. (Round to the nearest whole number.)

38) The amount of particulate matter left in solution during a filtering process is given by the equation $P = 200(2)^{-0.6n}$, where n is the number of filtering steps. Find the amounts left for $n = 0$ and $n = 5$. (Round to the nearest whole number.)

39) Use the formula $N = Ie^{kt}$, where N is the number of items in terms of the initial population I, at time t, and k is the growth constant equal to the percent of growth per unit of time. An artifact is discovered at a certain site. If it has 55% of the carbon–14 it originally contained, what is the approximate age of the artifact? (carbon–14 decays at the rate of 0.0125% annually.)

1) 10.1 years
2) 8.8 years
3) 1 years
4) 1 years
5) 6.8 years
6) 6.8 years
7) 13.6 minutes
8) 10.8 minutes
9) $P(t) = P_0e^{0.1t}$
10) $P(t) = P_0e^{0.08t}$
11) $P(t) = P_0e^{0.05t}$
12) $P(t) = P_0e^{0.02t}$
13) $P(t) = 22e^{0.01t}$, where $P(t)$ is in millions and t is the number of years after 1998.
14) $P(t) = 30e^{0.01t}$, where $P(t)$ is in millions and t is the number of years after 1998.
15) $P(t) = 38e^{0.04t}$, where $P(t)$ is in millions and t is the number of years after 1998.
16) $P(t) = 28e^{0.02t}$, where $P(t)$ is in millions and t is the number of years after 1998.
17) 53 years
18) 69 years
19) 20 years
20) 20 years
21) 3 years
22) 10 years
23) 2.2 years
24) $P(t) = P_0e^{0.03t}$
25) $P(t) = 27e^{0.05t}$, where $P(t)$ is in millions and t is the number of years after 1998.
26) 14 years
27) 4 years
28) 8 years
29) 1.9 years
30) $P(t) = P_0e^{0.04t}$
31) $P(t) = 26e^{0.03t}$, where $P(t)$ is in millions and t is the number of years after 1998.
32) 415 years
33) 2409 years
34) 462 years
35) 5 years
36) 300, 19
37) 900, 56
38) 200, 25
39) 4783 years