Math 3 Name _____

3.5 Compounding Interest and Population Growth Period _____

Evaluate each expression for the given value of x. Round to two decimal places.

1. 2^x for x = 4

2. $50(2)^{3x}$ for x = 5

3. 3. $100(3)^{x-1}$ for x = 6

4. $10(2)^{x+2}$ for x = 3.3

5. $75(0.5)^{2x}$ for x = $\frac{1}{3}$

6. 2^{2x-1} for x = 9

Predict the population of bacteria for each situation and time period.

7. 55 bacteria that double every hour.

a. after 3 hour b. after 5 hours

8. 33 bacteria that double every 30 minutes.

a. after 1 hour b. after 6 hours

State whether each function represents exponential growth or decay.

9. $f(x) = 500(2.5)^x$

10. $f(x) = 500\left(\frac{1}{2}\right)^x$

11. $f(x) = 500\left(\frac{5}{2}\right)^{-x}$

Directions: Use the compounding interest formula to answer the following questions. $A = P(1 + r/n)^{n*t}$

12. James invests $5,000 earning 2% interest compounded annually. Calculate the balance after 8 years.

13. Susan invests $12,000 earning 3% interest compounded daily. Calculate the balance after 3 years.

14. Meredith borrows an amount of $10,000 from a bank and the bank charges an interest rate of 6%, compounded *quarterly*. Calculate the balance after 2 years.

15. Regis borrows an amount of $15,200 from a bank and the bank charges an interest rate of 4%, compounded *Continually*. Calculate the balance after 5 years.

16. Fred borrows an amount of $1,000 from a bank and the bank charges an interest rate of 10%, compounded Continually. Calculate the balance after 6 years.

17. Hazel borrows an amount of $500 from a bank and the bank charges an interest rate of 8%, compounded *Monthly*. Calculate the balance after 15 years.

18. A bacteria culture doubles every 0.25 hours. At time 1.25 hours, there are 40 000 bacteria present. How many bacteria were present initially?

19. A bacteria culture starts with 3000 bacteria. After 3 hours there are 48 000 bacteria present. What is the length of the doubling period?

20. A bacteria culture triples every 4 hours and starts with 10 000 bacteria. Find the number of bacteria in the culture after 30 hours.

21. The world population doubles every 35 years. In 1980 the population was 4.5 billion. Assuming that the doubling period remains at 35 years, estimate the population in the year 2120.

22. The half-life of Palladiim-100 is 4 days. After 16 days an initial sample has been reduced to a mass of 0.75 g. Determine the starting mass.

23. Strontium-90 has a half-life of 25 years. How long would it take for 40 mg of it to decay to
(a) 20 mg (b) 1.25 mg

24. A colony of insects doubles every 10 days. If the colony has 850 insects today, how many are/were present
(a) in 30 days? (b) 10 days ago?

25. A cup of coffee contains approximately 96 mg of caffeine. When you drink the coffee, the caffeine is absorbed into the bloodstream and is eventually metabolized by the body. Every 5 hours the amount of caffeine present in the body is reduced by one-half. How many hours does it take for the amount of caffeine to be reduced to 12 mg?