NAME:_____

Worksheet 35 - Lesson 88

Compound Interest Formula						
, , , , , , , , , , , , , , , , , , ,	Compounded:					
 A(t) = P (1 + ^r/_n)^{nt} A(t) = amount: amount at given time P = principal: amount before interest is added r = interest rate: in decimal form t = time: number of years n = compoundings per year: times interest is compounded each year 	$-$ Annually: $n = 1$ $-$ Semiannually: $n = 2$ $-$ Quarterly: $n = 4$ $-$ Monthly: $n = 12$ $-$ Weekly: $n = 52$ $-$ Daily: $n = 365$ \vdots					
Continuously Compounded Interest Formula	Exponential Growth and Decay Formula					
$A(t) = Pe^{rt}$	 A(t) = A₀e^{kt} A(t) = amount: amount at given time A₀ = initial amount: amount at time t = 0 t = time: use the given units e = natural base: 2.718281828 k = growth or decay constant: 					
• $A(t) =$ amount : amount at given time						
• $P = $ principal : amount before interest is added						
• $r = $ interest rate : in decimal form						
• $t = $ time: number of years						
• $e = $ natural base : 2.718281828						
	$\begin{aligned} &- \text{ Growth if } k > 0 \\ &- \text{ Decay if } k < 0 \end{aligned}$					

1. In the standard notation given above, what should n be if the interest is compounted every minute?

2. If I deposit \$800 in a savings account at 6% interest compounded annually, and if I make no withdrawals or deposits for 4 years, how much will I have in my account at the end of 4 years?

3. Laura deposited \$2,000 in a CD account at 3% interest compounded monthly, and after 2 years, she withdrawals all the money from that bank and deposits in another CD account at another back which pays 3.5% compounded annually. How much will she have in her acount 3 years after she had invested in the new bank? If she did not change the banks, how much would she have had in 5 years after depositing \$2,000 in the first bank?

4. How much should I save today in a CD account, which pays 3% compounded monthly, if I am to have \$3000 in 5 years?

5. Michael's parents had deposited \$2,500 in an account which pays 2.25% interest compounded daily when Michael was born. If no money is deposited to or withdrawn from that account, then how old will Michael be when that account has a balance of \$5,000?

6. If you deposit \$1,000 in a CD at The First United Trust Bank of Far Far Away Land, which is run by Princess Fiona and Shrek, you are guaranteed to get \$1,500 after 5 years. All you know is they compound the interest semiannually. How much is their interest rate?

7. Calculate how much principal you need invested at 4% for 5 years to achieve \$1,000 under different compounding plans (keep 8 decimal places):

Plan	A	r	t	n	Р
Annually	\$1,000	0.04	5	1	
Semiannually	\$1,000	0.04	5	2	
Quarterly	\$1,000	0.04	5	4	
Monthly	\$1,000	0.04	5	12	
Weekly	\$1,000	0.04	5	52	
Daily	\$1,000	0.04	5	365	
Hourly	\$1,000	0.04	5	365×24	
Every Minute	\$1,000	0.04	5	$365 \times 24 \times 60$	
Every second	\$1,000	0.04	5	$365 \times 24 \times 60 \times 60$	
Continuously	\$1,000	0.04	5	-	

- 8. Growth of bacteria can be modeled as an exponential growth. At the start of an experiment there are 3,500 bacteria present. Two hours later, the population is 5,200.
 - (a) Determine the growth constant.
 - (b) Determine the population (to the nearest bacteria) five hours after the experiment began.
 - (c) When will the population reach 10,000?

- 9. Radioactive decay can be modeled as an exponential decay. The half-life (i.e. if you start with some amount, the time it takes to decay down to half of the starting amount) of Iodine-131 is 8 days.
 - (a) Determine the decay constant.
 - (b) If you start with a sample of 5 grams of Iodine-131, how much of it will remain after 6 days?
 - (c) How long will it take until only 1 gram of Iodine-131 is left?