

1. In 1990, the cost of tuition at The Ohio State University was \$4300. The tuition increases at a rate of 4% each year.

$$4300(1.04)^x$$

- a. How much would it cost to attend the university in 2015?

$$\$11463.10$$

- b. How much would it cost to attend in 2025?

$$\$16668.18$$

2. If you invest \$40 in an account for 10 years at a 1% interest rate compounded yearly how much money will you have?

$$40(1.01)^{10} = \$44.18$$

3. If you invest \$2040 in an account with 5% interest rate compounded yearly for 15 years how much money will you have?

$$2040(1.05)^{15} = \$4241.01$$

4. A type of bacteria has a very high exponential growth rate at 80% *every hour*. If there are 10 bacteria now, determine how many there will be in...

a. 5 hours:  $10(1.8)^5 = 1,88,96$  so 189

b. 1 day:  $10(1.8)^{24} = 13,382,588$

c. 1 week:  $10(1.8)^{168} = 7.687 \times 10^{43}$

5. Your parents invested some money into a college savings account when you were born. You intend to let the money accumulate until you turn 22 years old and use the money to pay off college loans. The rule  $f(x) = 475(1.085)^x$  gives the account balance after  $x$  years.

- a. How much money was put into the account when you were born?

$$\$475$$

- b. What is the interest rate for this account? *Explain how you know.*

$$8.5\%$$

- c. How much money will be in the account in 22 years? *Show your work.*

$$\$2858.56$$

6. The population of rabbits in East Fremont is 250 in September of 2004 and growing at a rate of 3.5% each month.
- a. If the rate of population growth remains constant, determine how many months will pass until the rabbit population will double.

$$250(1.035)^x = 500 \quad 21 \text{ months}$$

- b. If the rate of population growth remains constant, determine when the rabbit population will reach 128,000.

$$250(1.035)^x = 128000 \quad 182 \text{ months}$$

7. Suppose your elderly neighbor asked you to mow his lawn once a week this summer. He wants you come once a week for all 12 weeks of the summer. You are to choose between two payment plans.

**In plan 1**, you are paid \$50 per week.

**In plan 2**, you are paid \$0.10 for accepting the job, \$0.20 for the first week, \$0.40 for the second week, \$0.80 for the third week, etc.

- a. How much would your **total** pay for 12 weeks of summer be if you chose **Plan 1**? Show/explain how you found your answer:

Total Pay = \$600      Work/Explanation:  $50 \times 12 = 600$

- b. Complete the below table for Plan 2. Remember, the values in the table represent how much was earned on **that specific day**. It is **NOT** the total amount earned.

<b>Week Number</b>	0 (Day you were hired)	1	2	3	4	5	6
<b>Amount Earned (dollars)</b>	0.10	0.20	0.40	.8	1.6	3.2	6.4
<b>Week Number</b>	7	8	9	10	11	12	
<b>Amount Earned (dollars)</b>	12.8	25.6	51.2	102.4	204.8	409.6	

- c. Based on your answers to parts (a) and (b), which plan should you choose to make the most money? Explain.

Plan 2, you will make more money in the last two weeks as you would in all of Plan 1

- d. Write a rule in function notation that can be used to calculate each week's earnings under **plan 2**.

$$f(x) = (0.1) \cdot 2^x$$

8. A hypothetical strain of bacteria doubles every 5 minutes. One single bacterium was put in a sealed bottle at 9:00 a.m. and the bottle was filled at exactly 10:00 a.m. At what time was the bottle one-half full? (hint: think in terms of doubling time)

9:55 a.m.

9. Your uncle inherited land that was purchased for \$30,000 in 1960. The value of the land increased by approximately 5% per year. What is the approximate value of the land in the year 2015?

$$\begin{aligned} &= 30000(1.05)^x \\ &= 30000(1.05)^{55} \\ &= \$439068.93 \end{aligned}$$

10. A house on my street has 1200 termites. The termites grow at a rate of about 2.4% per day. How long until the number of termites doubles?

$$1200(1.024)^x = 2400$$

30 days

11. An old stamp is currently worth \$60. The stamp's value will grow 15% per year.

- a. What will the value of the stamp be in 8 years?

$$60(1.15)^8 = \$183.54$$

- b. When will the value of the stamp be worth 3 times the initial value?

$$60(1.15)^x = 180$$

8 years

12. Find the next three terms for the following sequence:

18, 54, 162, 486, 1458, 4374

$$r = 3$$

13. Find the  $n^{\text{th}}$  term of each sequence described below:

a.  $a_1 = 5, r = 3.5, n = 7$

$$a_7 = 5(3.5)^6 = 9191.33 = a_7$$

b.  $a_1 = \frac{1}{3}, r = -12, n = 6$

$$a_6 = \frac{1}{3}(-12)^5 = -82944 = a_6$$

c.  $a_1 = -8, r = \frac{1}{4}, n = 11$

$$a_{11} = (-8) \cdot \left(\frac{1}{4}\right)^{10} = \frac{-1}{131072} \text{ or } -.000008$$

14. Find the missing terms of the following sequence SHOW YOUR WORK:

a. 4, 24, 144, 864, 5184

$$5184 = 4 \cdot r^4$$

$$1296 = r^4$$

$$r = 6$$

b. 858, 429, 214.5, 107.25, 53.625, 26.8125

$$26.8125 = 858 \cdot r^5$$

$$.03125 = r^5$$

$$r = \frac{1}{2}$$