

Section 12.3—Exponential Growth and Decay

$$y = a(1+r)^t$$

$$y = a(1-r)^t$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Identify each of the following functions as exponential growth or decay. Then give the rate of growth or decay as a percent.

1. $y = 3(1.61)^t$ Growth $1.61 - 1 = .61$ or 61%

2. $y = 39(0.098)^t$ Decay $1 - .098 = .902$ or 90.2%

3. $y = a\left(\frac{2}{3}\right)^t$ $\frac{2}{3} = .667$ Decay $1 - .667 = .333$ or 33.3%

4. $y = a\left(\frac{5}{4}\right)^t$ $\rightarrow 1.25$ Growth $1.25 - 1 = .25$ or 25%

Write an exponential growth or decay function to model each situation. Then find the value of the function after the given amount of time.

5. The population of a country is 58,000,000 and grows by 0.1% per year; 3 years.

$$58000000(1 + .001)^3$$

$$= 58,174,174$$

6. An antique car is worth \$32,000 and its value grows by 7% per year; 5 years

$$32000(1 + .07)^5$$

$$= 44881.66$$

7. An investment of \$8200 loses value at a rate of 2% per year; 7 years

$$8200(1 - .02)^7$$

$$= 7118.63$$

8. A new car is worth \$25,000 and its value decreases by 15% each year; 6 years

$$25000(1 - .15)^6$$

$$= 9428.74$$

9. The student enrollment in a local high school is 970 students and increases by 1.2% per year; 5 years

$$970(1 + .012)^5$$

$$= 1030 \text{ PEOPLE}$$

Write an exponential function to model each situation and then solve.

10. Mendeleevium-258 has a half-life of approximately 52 days. Find the amount of Mendeleevium-258 left from a 44 gram sample after 156 days.

$$44(.5)^3$$

$$= 5.5$$

11. The amount of a 10-mg dose of a certain antibiotic decreases in your bloodstream at a rate of 16% per hour. Find the amount left (to the nearest hundredth) in the bloodstream after 4 hours.

$$10(1 - .16)^4$$

$$= 4.98$$

12. You invest \$1500 at a rate of 3.5% compounded annually. What is the investment worth after 4 years?

$$1500\left(1 + \frac{.035}{1}\right)^4 = 1721.28$$

This is compound interest

but can also be growth

b/c it is once annually

13. The cost of tuition at the University of Georgia is \$22,000 and is increasing at a rate of 6% each year. What will the cost of tuition be in 4 years?

$$22,000(1 + .06)^4$$

$$= 27774.49$$