Exponential Growth and Decay Problems 3   Name   *Answers*

1) On January 1, 1999, the price of gasoline was $1.39 per gallon. If the price of gasoline increased by 0.5% per month, what was the cost of one gallon of gasoline, to the nearest cent, on January 1 one year later?

$$y = 1.39(1+.005)^x$$

$$y = 1.39(1+.005)^{12} \qquad \leftarrow \text{1 year is 12 months}$$

$$y = 1.4757\cdots \qquad \boxed{\$1.48}$$

2) The height of a bouncing ball (measured in inches) after x bounces is represented by the equation $f(x) = 120(0.75)^x$. About how many times higher is the first bounce than the fifth bounce?

1st bounce: $y = 120(.75)^1$
$= 90$ ft.

5th bounce: $y = 120(.75)^5$
$= 28.4765\ldots$ ft

$$\frac{90}{28.476\cdots} \approx 3$$

First bounce is About 3 times higher than 5th bounce

3) A new $26,000 car depreciates by 12% every year.

a) Write an equation that shows the cost of the car, y, at year x.

$$y = 26,000(1-.12)^x \qquad \text{or} \qquad y = 26,000(.88)^x$$

b) How much will the car be worth in 6 years?

$$y = 26000(.88)^6 \rightarrow \boxed{\$12,074.51}$$

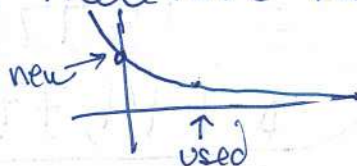c) How long will it take for the car to be worth less than $100?

try different years!   about 44 years

$$y = 26,000(.88)^4 \rightarrow \$93.80$$

d) Some people buy used cars so that the value of the car doesn't depreciate so quickly. Does this make sense? Explain your thinking.

Yes! A car that is used will be less expensive & it will therefore not lose as much value.

new →   ↑ used

4) The Franklins inherited $15,000, which they want to invest for their child's future college expenses. If they invest it at 3.25% with interest compounded monthly, determine the value of the account, in dollars, after 5 years. Use the formula $y = a(1+\frac{r}{n})^{nx}$ where y = value of the investment after x years, a = initial value (principal invested), r = annual interest rate, and n = number of times compounded per year.

$r = .0325$, $n = 12$, $a = 15,000$, $t = 5$

$$y = 15,000 \left(1 + \frac{.0325}{12}\right)^{(12 \cdot 5)}$$

$$y = 17642.849$$

$$\boxed{\$ 17,642.85}$$

5) You invest $10,000 in an account with 1.250% interest, compounded quarterly. Assume you don't touch the money or add money other than the earned interest.

$r = .0125$ $n = 4$

a) Write an equation that gives the amount of money, y, in the account after x years.

$$y = 10,000 \left(1 + \frac{.0125}{4}\right)^{4x}$$

b) How much money will you have in the account after 10 years?

$$y = 10,000 \left(1 + \frac{.0125}{4}\right)^{\wedge(4 \cdot 10)}$$

$$= \boxed{\$ 11,329.28}$$

c) How much money will you have in the account after 25 years?

$$y = 10,000 \left(1 + \frac{.0125}{4}\right)^{(4 \cdot 25)}$$

$$= 13,661.72089$$

$$\boxed{\$ 13,661.72}$$