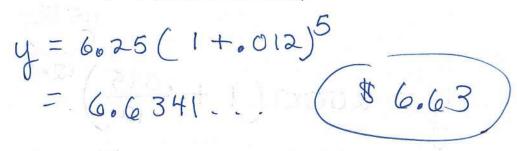**Exponential Growth and Decay Problems 5**   Name   *Answers*

1) The price for milk is $6.25 per gallon but is rising at a rate of 1.2% each year. At this rate, how much will a gallon of milk cost in 5 years. (Round to nearest cent.)

$$y = 6.25(1 + .012)^5$$
$$= 6.6341...$$ $6.63

2) The amount of medicine in the bloodstream after x hours can be shown by the equation $M = 200(0.8)^x$. About how many times more medicine is there in the bloodstream after one hour than after six hours?

1 hour → $M = 200(.8)^1$ → 160 mg

6 hours → $M = 200(.8)^6$ → 52.4288 mg

$160 \div 52.4288 = 3.0517$

about 3 times more

3) A new $600 ipad depreciates by 20% every year.

   a) Write an equation that shows the cost of the ipad, C, at year x.

$$y = 600(1 - .2)^x \quad \text{or} \quad y = 600(.8)^x$$

   b) How much will the ipad be worth in 5 years?

$$y = 600(.8)^5$$
$$= 196.608$$ $196.61

   c) How long will it take for the ipad to be worth less than $50?

Guess + check: try 10 years → $600(.8)^{10} = \$64$

about 12 years

11 years → $600(.8)^{11} = \$51$
12 years → $600(.8)^{12} = 41$

When figuring out compound interest, 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.

4) If I invest $2000 in a 5-year CD with 1.5% interest compounded monthly, how much money will I have after 5 years?

$$n = 12$$

$$y = 2000\left(1 + \frac{.015}{12}\right)^{12 \cdot 5}$$

$$= 2155.667337$$

$$\boxed{\$ 2,155.67}$$

5) If I invest $5,000 in a 1-year CD with 1.02% interest compounded daily, how much money will I have after 1 year?

$$n = 365$$

$$y = 5000\left(1 + \frac{.0102}{365}\right)^{365 \cdot 1}$$

$$= 5051.260267$$

$$\boxed{\$ 5,051.26}$$

6) You invest $10,000 in an account with 2% interest. Assume you don't touch the money or add money other than the earned interest.

a) How much money would be in the account after 20 years if interest were compounded annually?

$$n = 1$$

$$y = 10,000\left(1 + \frac{.02}{1}\right)^{1 \cdot 20}$$
$$= 14859.47396$$

$$\boxed{\$ 14,859.47}$$

b) How much money would be in the account after 20 years if interest were compounded daily?

$$y = 10,000\left(1 + \frac{.02}{365}\right)^{(365 \cdot 20)}$$
$$= 14918.08349$$

$$\boxed{\$ 14,918.08}$$

c) Which is the better deal and why?

Compounding daily is a better deal since you earn interest on interest.