Quiz 2 Practice

1. In 1990, the tuition at a private college was $15,000. Tuition has increased by about 5.2% each year.
    a. Write an equation to model the tuition at a private college t years after 1990.

    b. Estimate the tuition in 2024.

    c. Sketch a graph. Find the horizontal asymptote, x-intercept, and y-intercept.

    d. When will the tuition be $100,000?

2. A house was purchased for $200,000 in 2005. The value of the home increases by 5% per year.
    a. Write an equation to model the value of the house *t* years after 2005.

    b. How much is the house worth today (2025)?

    c. Sketch a graph. Find the horizontal asymptote, *x*-intercept, and *y*-intercept.

    d. When will the house be worth $1 million (1,000,000)?

3. You drink a beverage with 120 mg of caffeine. Each hour, the caffeine in your system decreases by about 12%.
    a. Write an equation to model the amount of caffeine in your system, in mg, t hours after you drink it.

    b. How much caffeine is in your systems after 4 hours?

    c. Sketch a graph. Find the horizontal asymptote, x-intercept, and y-intercept.

    d. How long until you have 10 mg of caffeine in your system?

4. You buy a new computer for $2100. The computer decreases by 1.2% each month.
    a. Write the equation to model the value of the computer *t* months after you buy it.

    b. What will be the value of the computer after 6 months?

    c. Sketch a graph. Find the horizontal asymptote, *x*-intercept, and *y*-intercept.

    d. When will the computer have a value of $500?

5. A company's total cost, in millions of dollars, is given by $C(t) = -40e^{-1.3t} + 200$, where *t* is the time in years since the start-up date.
    a. Graph $C(t)$. Find the *x*-intercept, the *y*-intercept and the horizontal asymptote.

    b. What is the meaning of the *y*-intercept?

    c. What is the meaning of the horizontal asymptote?

    d. When will the company's cost be $180 million?

6. It is reasonable for a manufacturer to expect the daily output of a new worker to start out slow and continue to increase over time, but then tend to level off, never exceeding a certain amount. A firm manufactures 5G smart phones and determines that after working *t* days, the efficiency, in number of phones produced per day, of most workers can be modeled by the function $N(t) = 80 - 70e^{-0.13t}$

    a. Graph $N(t)$. Find the *x*-intercept, the *y*-intercept and the horizontal asymptote.

    b. What is the meaning of the *y*-intercept?

    c. What is the meaning of the horizontal asymptote?

    d. When will the worker be able to produce 75 smart phones?

7. A company invests $30,000 in an account with 3.2% interest compounded monthly.
    a. How much money will be in the account after 8 years?

    b. How much interest will be earned in 8 years?

    c. When will the investment be worth triple its original amount?

8. A family is saving for their child's college education. They invest $10,000 in an account that pays 2.75% interest compounded quarterly.
    a. How much money will be in the account after 18 years?

    b. How much interest will be earned in 18 years?

    c. When will the account have $50,000 in it?

9. A company invests $50,000 in an account with 1.8% interest continuously compounded.
    a. How much money will be in the account after 10 years?

    b. How much interest will be earned in 10 years?

    c. When will the investment be worth $75,000?

10. You have $4000 to invest in an account with 2.3% interest continuously compounded.
    a. How much money will be in the account after 3 years?

    b. How much interest will be earned in 3 years?

    c. When will the account have $5000 in it?

11. What interest rate will allow $5300 to grow to $8000 in 5 years if interest is compounded daily?

12. What interest rate will allow $20,000 to double in 12 years if interest is compounded monthly?

13. How much money must be initially deposited into an account with 4.6% interest compounded daily if you want to have $10,000 in 5 years?

14. How much money must be initially deposited into an account with 1.9% interest compounded quarterly if you want to have $1,000 in 2 years?

15. The number of cell phone subscribers (in millions) in the United States can be modeled by $y = 233(1.058)^t$, where $t = 0$ represents the year 2006.
    a. What was the number of cell phone subscribers in 2006?

    b. Is the rent increasing or decreasing? By what percentage?

16. A cup of coffee is left out on a countertop. The temperature of the coffee, in degrees Fahrenheit, t minutes after it is left out can be modeled by $y = 169.1(0.971)^t$,. Let t = 0 represent 8 am
    a. What was the temperature of the coffee at 8 am?

    b. Is the temperature increasing or decreasing? By what percentage?