Name: ______________________________

2.2.D2 – MODELING WITH LINEAR FUNCTIONS

Past due on: __________ Period: _____

1. Housing prices in your neighborhood have been increasing steadily since you purchased your home in 2005. The relationship between the market value, V, of your home and the length of time, x, you have owned your home is modeled by the linear function $V(x) = 2500x + 125{,}000$ where $V(x)$ is measured in dollars and x in years.
   a. What is the slope of this line? What is the practical meaning of slope in this situation?

   b. Determine the vertical intercept. What is the practical meaning of the vertical intercept in the context of this problem?

   c. Determine and interpret the value $V(8)$.

2. The value of a car depreciates immediately after it is purchased. The value of a car you recently purchased can be modeled by the linear function $V(x) = 18500 - 1350x$ where $V(x)$ is the market value in dollars and x is the length of time you own your car in years.
   a. What is the slope of this line? What is the practical meaning of slope in this situation?

   b. Determine the vertical intercept. What is the practical meaning of the vertical intercept in the context of this problem?

   c. Determine the horizontal intercept. What is the practical meaning of the horizontal intercept in the context of this problem?

3. The owner of a gas station has $19,200 to spend on unleaded gas this month. Regular unleaded costs him $2.40 per gallon, and premium unleaded costs $3.20 per gallon.
   a. Let x represent the gallons of regular unleaded and y represent the gallons of premium unleaded. Write a linear function that represents total amount of money spent on unleaded gas.

   b. Find the x-intercept and interpret its meaning in terms of the situation.

   c. Find the y-intercept and interpret its meaning in terms of the situation.

   d. If the owner purchases 3000 gallons of premium unleaded gas, how many gallons of regular unleaded can be purchased?

4. According to the U.S. Bureau of the Census, the population of California in 2000 was approximately 34.1 million and was increasing at a rate of approximately 630,000 people per year. Let $P(t)$ represent the California population (in millions) and t represent the number of years since 2000.
   a. Write a linear function rule for $P(t)$ in terms of t.
   b. Use the linear model to predict the population of California in 2020.

5. The population of Atlanta, Georgia was 2.96 million in 1990 and 4.11 million in 2000. Let t represent the number of years since 1990 and $P(t)$ represent the population (in millions) at a given time, t.
   a. Assume that the average rate of change of the population over this 10-year period is constant. Determine this average rate/slope. What is the practical meaning of slope in this situation?
   b. Write a linear function rule for $P(t)$ in terms of t.
   c. Use the linear model to predict the population of Atlanta in 2020.

6. The population of Portland, Oregon was 2.39 million in 1990 and 2.36 million in 2000. Let t represent the number of years since 1980 and $P(t)$ represent the population (in millions) at a given time, t.
   a. Assume that the average rate of change of the population over this 10-year period is constant. Determine this average rate/slope. What is the practical meaning of slope in this situation?
   b. Identify the vertical intercept. What is the practical meaning of the vertical intercept in the context of this problem?
   c. Write a linear function rule for $P(t)$ in terms of t.
   d. Use the linear model to predict the population of Portland in 2020.