1. When you make a graph of the function \( z = f(w) \), which variable is plotted on the vertical axis? (2 pts)

a. \( w \)  
[b.] \( z \)  
[c. \( f \) ]

2. Suppose your pet dog weighed 2.5 pounds at birth, and weighed 15 pounds after one year. Based on these two data points find a linear function that describes how weight varies with age. Use this model to predict the dog’s weight at 5 and 10 years of age. (3 pts)

First we compute the slope:

\[
m = \frac{\Delta y}{\Delta x} = \frac{15 - 2.5}{1 - 0} = 12.5.
\]

Now we use the fact that \( b = 2.5 \), because \( b \) is the initial value, or the \( y \)-intercept, to obtain the linear function:

\[
y = b + mx
\]

\[
y = 2.5 + 12.5x.
\]

Finally, we just let \( x = 5 \) and \( x = 10 \), and compute for \( y \):

\[
y = 2.5 + 12.5 \times 5 = 65,
\]

\[
y = 2.5 + 12.5 \times 10 = 127.5.
\]

3. A $1,200 washing machine in a laundromat is depreciated for tax purposes at a rate of $75 per year. Find a function for the depreciated value of the washing machine as it varies with time. When does the depreciated value reach $0? (3 pts)

\[
y = b + mx \Rightarrow y = 1200 - 75x.
\]

Now we just let \( y = 0 \) and solve for \( x \):

\[
0 = 1200 - 75x
\]

\[
75x = 1200
\]

\[
x = \frac{1200}{75} = 16.
\]
For problems 4 and 5: In each case, write an equation for the linear function and use it to answer the given question. Be sure to clearly identify the independent and dependent variables.

4. The price of a particular model car is $15,000 now, and rises with time at a constant rate of $800 per year. How much will a new car cost in 3.5 years? (3 pts)

The cost depends on time, so time is the independent variable, while the cost is the dependent variable. The linear function is \( y = 15000 + 800x \). To calculate how much this model car will be worth in 3.5 years, we simply let \( x = 3.5 \), and solve for \( y \):

\[
y = 15000 + 800 \times 3.5 = 17800.
\]

5. A snowplow has a maximum speed of 40 miles per hour on a dry highway. Its maximum speed decreases by 1.1 miles per hour for every inch of snow on the highway. According to this model, at what snow depth will the plow be unable to move? (3 pts)

The speed depends on snow depth, so speed is the dependent variable, snow-depth is the independent variable. The linear model is \( y = 40 - 1.1x \), and it’s unable to move when its speed is equal to zero, or when \( y = 0 \):

\[
\begin{align*}
0 &= 40 - 1.1x \\
1.1x &= 40 \\
x &= \frac{40}{1.1} = 36.4,
\end{align*}
\]

so it will be unable to move when the depth reaches 36.4 inches.