8. [14 points] Your pet bird is flying in a straight path toward you and away from you for a minute. After $t$ seconds, she is $f(t)$ feet away from you, where

$$f(t) = \frac{-t(t - 20)(t - 70)}{500} + 20, \quad 0 \leq t \leq 60.$$ 

A graph of $y = f(t)$ is shown here.

a. [3 points] Without doing any calculations, determine which is greater: the average velocity of the bird over the entire minute, or her instantaneous velocity after 30 seconds. Explain, referring to the graph.

b. [3 points] Calculate the exact value of the average velocity of the bird over the entire minute.
8. (continued) The formula for $f$ and its graph are repeated below for your convenience.

$$f(t) = \frac{-t(t - 20)(t - 70)}{500} + 20, \quad 0 \leq t \leq 60.$$ 

\begin{center}
\begin{tikzpicture}
  \begin{axis}[
    title={$f(t)$},
    xlabel =$t$,
    ylabel =$y$,
    xmin=0,
    xmax=60,
    ymin=0,
    ymax=80,
    ]
  \addplot[domain=0:60,samples=100]{-1/500*(x*(x-20)*(x-70))+20};
\end{axis}
\end{tikzpicture}
\end{center}

c. [4 points] Write an explicit expression for the velocity of the bird at time $t$ using the limit definition of velocity. Final answers containing the letter $f$ will receive no credit. Do not evaluate your expression.

d. [4 points] After a minute, you scare the bird, and she flies away at 9 feet/sec. Write a formula for a continuous function $f(t)$ describing the distance between you and the bird for $0 \leq t \leq 180$. 