7. [17 points] Passengers on a cruise ship watch as nearby dolphins and porpoises jump through the waves. When one dolphin jumps, its height above the water (measured in feet) t seconds after leaving the water is given by $w(t) = -16t^2 + 96Dt$ for some positive constant D.

   a. [3 points] After how many seconds, in terms of D, does this dolphin land back in the water?

   Answer: _____

   b. [7 points] Use the method of completing the square to rewrite $w(t)$ in vertex form. What is the vertex of the graph of $w(t)$? (Carefully show your work step-by step. Your answers may involve D.)

   Vertex Form: $w(t) =$ _____ **Vertex:** _____

   c. [2 points] If the dolphin reaches a maximum height of 16 ft before falling back to the water, find the value of D.

   Answer: $D =$ _____

   d. [5 points] A nearby porpoise is also seen jumping. Its height above the surface of the water (measured in meters) t seconds after the *dolphin* left the water is given by $h(t) = -5t^2 + 24t - 26$. For how long is the porpoise above the surface of the water? *Solve for the answer algebraically and give your final answer either in exact form or accurate to at least three decimal places.*

   Answer: _____