8. [12 points] Let \( f(x) = a^x \) and \( g(x) = c + dx \) where \( a, c \) and \( d \) are constants. The graph of \( y = f(x) \) and \( y = g(x) \) are shown below. The point of intersection not lying on the y-axis has coordinates \((x_0, y_0)\).

![Graph of functions f(x) and g(x)]

a. [10 points] In each of the bullet points below, you are asked to circle the option that must be true based on the graph above. If there is not enough information to decide on any of the options in a given row, circle NOT ENOUGH INFORMATION.

- The constants \( a \) and \( c \) satisfy:
  - \( a > c \)  
  - \( a < c \)  
  - \( a = c \)  
  NOT ENOUGH INFORMATION

- The constants \( a \) and \( d \) satisfy:
  - \( a > d \)  
  - \( a < d \)  
  - \( a = d \)  
  NOT ENOUGH INFORMATION

- The constants \( c \) and \( d \) satisfy:
  - \( c > d \)  
  - \( c < d \)  
  - \( c = d \)  
  NOT ENOUGH INFORMATION

- If the constants \( a \) and \( c \) remain the same while the value of the constant \( d \) increases, then the value of \( x_0 \), the \( x \)-coordinate of the point of intersection of \( f(x) = a^x \) and \( g(x) = c + dx \):
  INCREASES  DECREASES  STAYS THE SAME  NOT ENOUGH INFORMATION

- If the constants \( a \) and \( c \) remain the same while the value of the constant \( d \) increases, then the value of \( y_0 \), the \( y \)-coordinate of the point of intersection of \( f(x) = a^x \) and \( g(x) = c + dx \):
  INCREASES  DECREASES  STAYS THE SAME  NOT ENOUGH INFORMATION

b. [2 points] The graph of the function \( h(x) \) has a vertical intercept at \((0, -2)\) and is perpendicular to the graph of \( g(x) = c + dx \). Find a formula for the function \( h(x) \). Your formula may include any or all of the constants \( a, c \) and \( d \).

**Solution:** The slope of \( h(x) \) must be \(-\frac{1}{a}\). Since it has vertical intercept \(-2\), its equation must therefore be \( h(x) = -\frac{1}{a}x - 2 \).

\[
h(x) = -\frac{1}{d}x - 2
\]