Homework 7, Graded Problems.

1. Suppose that \( y = f(xg(x)) \), where \( f \) and \( g \) are unknown functions of \( x \).

   (a) Find \( y'(x) \).

   (b) Use the table of values below to compute \( y'(4) \).

\[
\begin{array}{c|cc}
 x & 4 & 8 \\
 f(x) & -1 & 5 \\
 f'(x) & 2 & -4 \\
 g(x) & 2 & -3 \\
 g'(x) & 5 & 0 \\
\end{array}
\]

2. Suppose that a particle moves along the \( y \)-axis with position at time \( t \geq 0 \) given by

\[ y(t) = a \sin(\omega t) \]

Here \( a \) and \( \omega \) are positive constants.

(a) At what times in the interval \([0, \pi/\omega]\) does the particle have velocity zero?

(b) What is the total distance traveled by the particle in the time interval \([0, \pi/\omega]\)?

3. Suppose that \( y \) is a function of \( x \) and that

\[
\frac{y^2 + x^2}{xy} = 2y + x
\]

Compute \( \frac{dy}{dx} \) when \( x = 2 \) and \( y = -2 \).

4. Find all points on the ellipse

\[
\frac{x^2}{4} + \frac{y^2}{9} = 1
\]

where the tangent slope is -1. Give both \( x \)-and \( y \)-coordinates for each point.