Part 1

- Find \( y'(2) \) for each problem.
- Five points per problem.
- Use the following facts as needed:

\[
f(2) = 0, \quad g(2) = 4, \quad f'(2) = 1, \quad g'(2) = 3
\]

1. \( y = xf(x)g(x) \)

2. \( y = f(x^2 - 2) + g(x) \)

3. \( y = \frac{[f(x)]^2}{g(x)} \)

4. \( y = f \left( \frac{g(x)}{x} \right) \)
Part 2

- Five points per problem.
- In each of these problems, assume that

\[ xy + y^2 = 4x \]

1. Suppose that \( y \) is a function with input \( x \). Find \( \frac{dy}{dx} \) at the point where \( x = 2 \) and \( y = -4 \).

2. Suppose that \( x \) is a function with input \( y \). Find \( \frac{dx}{dy} \) at the point \( y = 2 \).
3. Suppose that both $x$ and $y$ are functions with input $t$. Find $\frac{dx}{dt}$ at the time $t = 0$. Assume that at time $t = 0$ we know

$$y(0) = 3, \quad \text{and} \quad \frac{dy}{dt} = 1$$