

You have 20 minutes to take this quiz. Each problem will be graded for clarity of work as well as correctness, so show all work **clearly and in order**. Circle or otherwise indicate your final answers. Please note that there are problems on both the front and the back of this page.

**1.** (12 points) [Similar to #38 and #39, 7.3]

This problem concerns the graph of the equation  $xy^2 + 3x^2 = 4$ , which implicitly defines  $y$  as a function of  $x$ .

(a) Find all points on the graph with an  $x$ -coordinate of  $x = 1$ .

(b) Use implicit differentiation to find  $\frac{dy}{dx}$ .

(c) Find the slope of the tangent line at each of the points on the graph whose  $x$ -coordinate is 1.

*Turn over for more...*

**2.** (4 points) [Similar to #49, 5.2]

Find a function  $f$  whose *derivative* is  $f'(x) = x(4 - 2x)$  such that  $f(0) = 0$ .

**3.** (4 points) [Similar to #27, 1.7]

Consider the functions  $f(x) = \frac{x}{1-x}$  and  $g(x) = \frac{x}{1+x}$ . Use the definition of inverse functions to show that  $g$  is the inverse of  $f$ . (Do *not* try to solve for the inverse of either function; use the *definition* of what it means for  $f$  and  $g$  to be inverses of each other.)