## HOMEWORK 3 - MATH 112 DUE DATE: Monday, October 8 INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Four out of the eight problems will be chosen at random and graded. Each problem graded is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

## GOOD LUCK!!

- 1. Compute the derivatives of
  - (a)  $f(x) = \frac{3-2x-x^2}{x^2-1}$ (b)  $g(x) = (x^7 + 6x^4 + 3)(x^{12} + 3x^8 - x^5)$
- 2. Compute the following derivatives using the general power rule:
  - (a)  $f(x) = (4 7x)^9$ (b)  $g(x) = \sqrt[3]{(9x^2 + 4)^2}$ (c)  $h(x) = \frac{1}{(x^3 + 3x^2 - 7)^5}$
- 3. Compute the following derivatives:
  - (a)  $f(x) = x\sqrt[5]{2x+3}$ (b)  $g(x) = \sqrt{\frac{3-2x}{4x+1}}$ (c)  $h(x) = (\frac{4x^2}{3-x})^3$
- 4. Find the equation of the tangent line to the graph of the function  $f(x) = \frac{x}{\sqrt{25+x^2}}$  at the point (0,0).
- 5. Find the third derivative of the function:
  - (a)  $f(x) = x^4 2x^3$ (b)  $g(x) = \frac{2}{3x^5}$
- 6. (a) Given that f''(x) = 20x<sup>3</sup> 36x<sup>2</sup> find f'''(x).
  (b) Given that f<sup>(4)</sup>(x) = (3x + 1)<sup>7</sup>, find f<sup>(6)</sup>(x).
- 7. Use implicit differentiation to compute the derivative  $\frac{dy}{dx}$ :
  - (a)  $xy^2 + 4xy = 10$
  - (b)  $\frac{xy-y^2}{y-x} = 1$
- 8. Find  $\frac{dy}{dx}$  by implicit differentiation and evaluate the derivative at the indicated point:
  - (a)  $x^3 xy + y^2 = 4$  at (0, -2)
  - (b)  $\sqrt{xy} = x 2y$  at (4, 1)
  - (c)  $(x+y)^3 = x^3 + y^3$  at (-1,1)