

## HOMEWORK 3 - MATH 112

DUE DATE: Monday, February 12

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)  $h(x) = \left(\frac{4x^2}{3-x}\right)^3$

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  $f''(x) = 20x^3 - 36x^2$  find  $f'''(x)$ .

(b) Given that  $f^{(4)}(x) = (3x + 1)^7$ , find  $f^{(6)}(x)$ .

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  $(-1, 1)$