

HOMEWORK 3 - MATH 112

DUE DATE: Monday, February 6

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show 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 $(-1, 1)$