

## HOMEWORK 7 - MATH 112

DUE DATE: Monday, April 2

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. Find the indefinite integral and check your answer by performing the appropriate differentiation:

$$(a) \int (x^2 - 2x + 3)dx \quad (b) \int (\sqrt{x} + \frac{1}{2\sqrt{x}})dx \quad (c) \int \frac{x^2 + 1}{x^2}dx$$

2. Find the particular solution  $y = f(x)$  that satisfies the given differential equation and initial condition:

$$(a) f'(x) = \frac{1}{5}x - 2; f(10) = -10$$

$$(b) f'(x) = \frac{2-x}{x^3}, x > 0; f(2) = \frac{3}{4}$$

3. Find a function  $f$  that satisfies the given conditions:

$$(a) f'(x) = \frac{6}{x^2}, f(2) = 5$$

$$(b) f''(x) = x^{-2/3}, f'(8) = 6, f(0) = 0$$

4. Find the indefinite integral and verify your result using differentiation:

$$(a) \int (x^2 - 1)^3(2x)dx$$

$$(b) \int \frac{x^2}{(x^3-1)^2}dx$$

$$(c) \int \frac{x^2}{\sqrt{1-x^3}}dx$$

5. Use formal substitution to find the indefinite integrals:

$$(a) \int x^2 \sqrt[3]{x^3 + 5}dx$$

$$(b) \int \frac{x^2+1}{\sqrt{x^3+3x+4}}dx$$

$$(c) \int \sqrt{x}(4 - x^{3/2})^2dx$$

6. Find the equation of the function  $f$  whose graph passes through the point  $(0, \frac{7}{3})$  and whose derivative is  $f'(x) = x\sqrt{1-x^2}$ .

7. Use the exponential rules to find the following indefinite integrals:

$$(a) \int e^{4x}dx$$

$$(b) \int 5x^2 e^{x^3}dx$$

$$(c) \int 3(x-4)e^{x^2-8x}dx$$

8. Use the logarithmic rules to find the following indefinite integrals:

$$(a) \int \frac{1}{5x-6}dx$$

$$(b) \int \frac{x^2}{x^3+5}dx$$

$$(c) \int \frac{1}{x \ln x}dx$$