HOMEWORK 10 - MATH 160

DUE DATE: Tuesday, November 17

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the ten problems will be chosen at random and graded for a total of 20 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the indefinite integrals:
   (a) $\int (\sqrt[3]{x^2} - \frac{1}{x^2})dx$
   (b) $\int x^{-2}(1 - x^2 + x^4)dx$
   (c) $\int (\frac{1}{x^2} - \frac{1}{\sqrt[3]{x^2}} + \frac{1}{\sqrt{x}})dx$

2. Find the indefinite integrals:
   $(a) \quad \int \frac{x^3 + \sqrt[3]{x}}{x^2}dx \qquad (b) \quad \int (x+1)^2(1 - \frac{1}{x})dx.$

3. Find $y = f(x)$ by solving the differential equation:
   $(a) \quad f'(x) = \frac{1}{\sqrt{x}}; \quad f(4) = 2; \qquad (b) \quad f'(x) = 1 + e^x + \frac{1}{x}; \quad f(1) = 3 + e.$

4. Find the function $y = f(x)$ given that the slope of the tangent line to the graph of $y = f(x)$ at any point $(x, f(x))$ is $f'(x) = \frac{2}{x} + 1$ and that its graph passes through the point $(1, 2)$.

5. Find the indefinite integrals:
   (a) $\int x^2(2x^3 + 3)^4 dx$
   (b) $\int \frac{x^2-1}{x^3-3x+1}dx$
   (c) $\int x^2 e^{x^3-1}dx$

6. Find the indefinite integrals:
   (a) $\int \frac{e^{2x}}{1+e^{2x}}dx$
   (b) $\int \frac{1}{x(\ln x)^2}dx$
   (c) $\int \frac{e^{-x}-1}{e^{-x}+x}dx$

7. Find the function $y = f(x)$, given that the slope of the tangent line to the graph of $y = f(x)$ at any point $(x, f(x))$ is $f'(x) = 1 - \frac{2x}{x^2+1}$ and that its graph passes through the point $(0, 2)$.

8. A fighter aircraft is launched from the deck of a Nimitz-class aircraft carrier with the help of a steam catapult. If the aircraft is to attain a takeoff speed of at least 240 feet per second after traveling 800 feet along the flight deck, find the minimum acceleration it must be subjected to, assuming that it is constant.

9. In calm waters the oil spilling from the ruptured hull of a grounded tanker forms an oil slick that is circular in shape. If the radius r of the spill is increasing at the rate of $r'(t) = \frac{30}{\sqrt{2t+4}}$ feet per minute t minutes after the rupture occurs, find an expression for the radius at any given time t.

10. Find an approximation of the area of the region R under the graph of the function $f(x) = \frac{1}{x}$ on the interval $[1, 3]$ using 4 subintervals and right endpoints.