HOMEWORK 8 - MATH 151

DUE DATE: Monday, April 5
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework 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. Verify that the hypotheses of Rolle's Theorem are satisfied on the given interval and find all values c in that interval that satisfy the conclusion of the theorem.
   (a) $f(x) = x^3 - 3x^2 + 2x; [0, 2]$
   (b) $f(x) = \frac{1}{x^2} - \frac{4}{3x} + \frac{1}{3}; [1, 3]$
2. Verify that the hypotheses of the Mean Value Theorem are satisfied on the given interval and find all values c in that interval that satisfy the conclusion of the theorem.
   (a) $f(x) = x^3 + x - 4; [-1, 2]$
   (b) $f(x) = \sqrt{25 - x^2}; [-5, 3]$
3. Use 5 rectangles to approximate the area between the graph of the function f and the interval $[a, b]$.
   (a) $f(x) = \frac{1}{x+1}; [a, b] = [0, 1]$
   (b) $f(x) = \sqrt{1 - x^2}; [a, b] = [-1, 1]$
4. Use simple area formulas from geometry to find the area function $A(x)$ that gives the area between the graph of the function f and the interval $[a, x]$. Confirm that $A'(x) = f(x)$ in every case.
   (a) $f(x) = 3x - 3; [a, x] = [1, x]$
   (b) $f(x) = 2x + 2; [a, x] = [2, x]$
5. Find the derivative and then state the corresponding integration formula:
   (a) $\frac{d}{dx}[\frac{x}{x^2+3}]$
   (b) $\frac{d}{dx}[\sin x - x \cos x]$
6. Evaluate the integrals:
   (a) $\int \sqrt[3]{x^2} dx$
   (b) $\int \frac{1}{x^7} dx$
   (c) $\int x^{-7/8} dx$
   (d) $\int (x^{2/3} - 4x^{-1/5} + 4) dx$

(e) $\int(\frac{7}{y^{3/4}} - \sqrt[3]{y} + 4\sqrt{y})dy$

7. Evaluate the integrals and check your answers by differentiating:

   (a) $\int(2+y^2)^2 dy$

   (b) $\int \frac{1-2t^3}{t^3} dt$

   (c) $\int[\frac{1}{2t} - \sqrt{2}e^t]dt$

   (d) $\int \sec x(\tan x + \cos x)dx$

   (e) $\int \frac{\sin 2x}{\cos x} dx$

8. Solve the initial value problems:

   (a) $\frac{dy}{dx} = \frac{1}{(2x)^3}; y(1) = 0$

   (b) $\frac{dy}{dx} = x^2\sqrt{x^3}; y(0) = 0$

   (c) $\frac{dy}{dt} = \frac{3}{\sqrt{1-t^2}}; y(\frac{\sqrt{3}}{2}) = 0$