

## HOMEWORK 8 - MATH 151

DUE DATE: Thursday, April 12

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Four out of the ten 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. Use the midpoint rule with  $n = 5$  to approximate the integral  $\int_0^1 \sin(x^2)dx$ . Use your calculator only in the final step.
2. Use the form of the definition of the definite integral given in Theorem 4 of page 264 of your book to evaluate the integral  $\int_1^4 (x^2 + 2x - 5)dx$ .
3. Evaluate the following integrals by interpreting them as areas and then using familiar area formulas:

(a)  $\int_{-2}^2 \sqrt{4 - x^2} dx$

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

4. Use property 8 on page 273 to estimate the value of the integrals:

(a)  $\int_0^2 \sqrt{x^3 + 1} dx$

(b)  $\int_{\pi/4}^{3\pi/4} \sin^2 x dx$

5. Evaluate the following integrals:

(a)  $\int_1^8 \sqrt[3]{x^2} dx$    (b)  $\int_{-2}^{-1} (4y^3 + \frac{2}{y^3}) dy$    (c)  $\int_0^1 10^x dx$    (d)  $\int_{1/2}^{\sqrt{3}/2} \frac{6}{\sqrt{1-t^2}} dt$

6. The acceleration function in meters per square seconds of a particle moving along a straight line is given by  $a(t) = 2t + 3, 0 \leq t \leq 3$ , and its initial velocity by  $v(0) = -4$ . Find the velocity of the particle at time  $t$  and the distance traveled by the particle from time  $t = 0$  to time  $t = 3$ .
7. Water flows from the bottom of a storage tank at a rate of  $r(t) = 200 - 4t$  liters per minute, where  $0 \leq t \leq 50$ . Find the amount of water that flows from the tank during the first 10 minutes.
8. Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function:

(a)  $f(x) = \int_1^x \ln t dt$

(b)  $f(x) = \int_0^{x^2} \sqrt{1+r^3} dr$

(c)  $f(x) = \int_{\sin x}^{\cos x} (1+v^2)^{10} dv$

9. Find the average value of  $f(x) = \frac{1}{x}$  in the interval  $[1, 4]$  and the average value of  $g(x) = \cos x$  in the interval  $[0, \frac{\pi}{2}]$ .
10. Evaluate the following integrals by the substitution method:

(a)  $\int x(4+x^2)^{10} dx$    (b)  $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$    (c)  $\int e^{\sin \theta} \cos \theta d\theta$