

HOMEWORK 9 - MATH 151

DUE DATE: Monday, December 10

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. A particle is moving with the given data. Find the position of the particle:

(a) $v(t) = \frac{3}{2}\sqrt{t}$, $s(4) = 10$.

(b) $\alpha(t) = 10 \sin t + 3 \cos t$, $s(0) = 0$, $s(2\pi) = 12$.

2. 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.

3. Use the form of the definition of the definite integral given in Theorem 4 of page 264 of your book to evaluate the integral $\int_1^4 (x^2 + 2x - 5)dx$.

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) $\int e^{\sin \theta} \cos \theta d\theta$