

Math 229, Section 9

Instructor: Racovitan Mihai

Name _____

Home take Examen B

Due: Monday, 12/04/06

Z-number _____

Instructions: Answer all questions in the space provided. You must show all work in order to receive full credit.

- (Ex. 1) (8 pts.) Use Newton's method to find the absolute minimum value of the function $f(x) = x^2 + \sin x$ correct to six decimal places.

- (Ex. 2) (6 pts.) A piece of wire 10 meters long is cut into two pieces. One piece is bent into a square and the other into a circle. How should the wire be cut so that the total area enclosed is a maximum?

(Ex. 3) (6 pts.) Find the derivative of the following function : $g(x) = \int_x^{10} \tan \theta \, d\theta$. State the theorem you use, and check if the function satisfies the conditions of the theorem.

(Ex. 4) (18 pts., 6 pts. each) Find the following indefinite integrals.

(a) $\int \frac{x^4 + 3\sqrt{x}}{x^3} \, dx$

(b) $\int (\sin \theta + \cos \theta)^2 \, d\theta$

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

(Ex. 5) (6 pts.) Write down in numbers the Riemann sum that approximates the area under the curve $f(x) = \sqrt{x} - 1$ between 0 and 4 using 5 subintervals (rectangles) and left endpoints as sample points.

(Ex. 6) (6 pts.) Find a function f such that $f'(x) = x^3$ and the line $x - y = 0$ is tangent to the graph of f .

(Ex. 7) (24 pts., 6 pts. each) Evaluate the following definite integrals. Provide numerical solutions.

(a)
$$\int_1^4 \left(\sqrt{x} - \frac{1}{\sqrt{x}} \right)^2 dx$$

(b)
$$\int_1^9 \frac{2x + 1}{\sqrt{x}} dx$$

(c) $\int_0^1 x \left(1 - \sqrt{x} + \sqrt[3]{x^2}\right) dx$

(d) $\int_0^{\frac{\pi}{3}} \frac{\sin \theta + \sin \theta \cot^2 \theta}{\csc^2 \theta} d\theta$

(Ex. 8) (26 pts.) Let $f(x) = \frac{x^3 - 1}{x^3 + 1}$.

(a) (2 pts.) Determine the domain of $f(x)$.

(b) (4 pts.) Find the x and y intercepts, and symmetry (if any)

(c) (6 pts.) Find the vertical and the horizontal asymptotes.

(d) (5 pts.) Find the critical points, intervals of increase and decrease, and relative extremes if any.

(e) (5 pts.) Find inflections points and concavity.

(f) (4 pts.) Sketch the graph of the curve.