

Math 231 Practice Midterm 2

1. Let $f(x) = x^4 - 2x^3 + x^2$.

(i) Find the critical numbers of f .

(ii) Find the absolute maximum and minimum of f on the interval $[0, 1]$.

2. Let $f(x) = 4x^3 - 6x^2 + 1$.

(a) Find the intervals on which f is increasing or decreasing.

(b) Find the intervals of concavity and the inflection points.

(c) Sketch the graph of f .

3. A rectangular storage container with an open top is to have a volume of 20 m^3 . The length of its base is twice the width. Material for the base costs \$5 per square meter. Material for the sides costs \$9 per square meter. Find the cost of materials for the cheapest such container.

4. A particle is moving along a straight line with the given data. Find the position function $s(t)$.

$$a(t) = 20t^3 - 30t^2 + 10t, \quad s(0) = 0, \quad s(1) = 0.$$

5. Evaluate the integral.

(a) $\int_0^1 (1 + x^2)^2 dx$

(b) $\int_1^4 \frac{3y - 2}{\sqrt{y}} dy$

(c) $\int_0^{2\pi} (1 - \sin^2 \theta) \cos \theta d\theta$

(d) $\int te^{-t^2} dt$

(e) $\int \frac{1}{s \ln s} ds$