

1. 10 pts. Use the Closed Interval Method to find the absolute extreme values of

$$f(x) = x - 2 \cos x$$

on $[-\pi, \pi]$.

2. 7 pts. each Let $f(x) = \frac{x^2}{x^2 - 4}$.

(a) Find the domain and intercepts of f .

(b) Find the asymptotes of f .

(c) Find the critical points of f .

(d) Use the Monotonicity Test to find intervals of increase and decrease, and use either the First Derivative Test or Second Derivative Test to find all local extrema.

(e) Use the Concavity Test to find intervals where f is concave up or down, and identify inflection points.

3. 10 pts. Find the point P on the line $y = -2x$ that is closest to the point $(-20, 0)$. What is the distance between P and $(-20, 0)$?

4. 15 pts. A farmer with 400 feet of fencing wants to enclose a rectangular area and divide it into three sections by using two interior fences parallel to one side of the rectangle. Find the dimensions that maximize the area. Also find the maximum area.

5. 10 pts. Find a linear approximation to $\sqrt[3]{7}$, rounding the approximation to six decimal places.

6. 10 pts. Show that the equation $x^5 + 10x + 3 = 0$ has exactly one real root.

7. 10 pts. each Use L'Hôpital's Rule to evaluate each limit.

(a) $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$, where $a, b \neq 0$

(b) $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \csc x \right)$

8. 10 pts. each Determine the following indefinite integrals.

(a) $\int \left(\frac{5}{t^2} + 4t^2 \right) dt.$

(b) $\int (\cos 2x - \csc^2 8x) dx.$