

Math 141 Sample Midterm 2

1. Let $f(x) = x^3 - x + 3$ on $[-2, 0]$. Carefully state the Mean Value Theorem, including all hypothesis (when it can be used), and then find the number c given by the Mean Value Theorem.
2. Let $f(x) = \frac{x}{\sqrt{2}} + \cos x$ on the interval $[0, 2\pi]$.
 - a. Where is $f(x)$ increasing?
 - b. Where is $f(x)$ concave up?
 - c. Does the mean value theorem apply here? What does it say exactly in this case?
3. Draw the graph of one function g with all of the following properties:
 - a. g is continuous on $(-4, 4)$.
 - b. $g'(-1)$ does not exist.
 - c. $g'(1) = -1$.
 - d. $g'(x) < 0$ for all x satisfying $0 \leq x \leq 2$.
 - e. The line tangent to the graph of $g(x)$ at $x = 3$ is equal to $-x + 2$.
4. A farmer has 2400 ft of fencing and wants to fence a rectangular field that borders of a straight river (no fencing is needed along the river). What are the dimensions of the field of largest area?
5. Find the point on the graph of $f(x) = \sqrt{4x + 9}$ closest to the point $(1, 0)$.
6. Apply Newton's method a few times to $x^5 - x + 1$ in order to find where the function is equal to 0.