

1. Let $f(x) = x^3 + 3x^2 - 45x + 18$.
 - a. Find the critical numbers (the x -values where $f'(x) = 0$ or $f'(x)$ DNE), if any.
 - b. Use your answer to part (a) find the maximum and minimum values of $f(x)$ on the interval $[2, 5]$.

2. Let $g(x) = \ln(x^2 - 8x + 20)$. Find the critical numbers, if any, and use them to find maximum and minimum values of $f(x)$ on the interval $[0, 10]$.

3. Let $h(x) = \begin{cases} x^2 + 2x + 3 & x \leq 1 \\ x^2 - 4x + 9 & x > 1 \end{cases}$.
 - a. Is $h(x)$ continuous at $x = 1$?
 - b. Is $h(x)$ differentiable at $x = 1$?
 - c. Find the critical numbers of $h(x)$. (Hint: there are three.)
 - d. Find the maximum and minimum values of $h(x)$ on the interval $[0, 2]$.
 - e. Find the maximum and minimum values of $h(x)$ on the interval $[-2, 5]$.