

Drill Handout Section 4.3 October 31, 2019 Name: _____

- (1) Sketch a graph of a function that is continuous on $(-\infty, \infty)$ and has the following properties. Use a sign graph to summarize information about the function.

(a) $f'(-1)$ is undefined; $f'(x) > 0$ on $(-\infty, -1)$; $f'(x) < 0$ on $(-1, \infty)$.

(b) $f'(-2) = f'(2) = f'(6) = 0$; $f'(x) \geq 0$ on $(-\infty, \infty)$.

- (2) First Derivative Problems:

(a) Find the intervals on which $f(x) = x^2 - \ln x$ is increasing and decreasing.

(b) Locate the critical points of $f(x) = 2x^5 - 5x^4 - 10x^3 + 4$ on $[-2, 4]$ and use the First Derivative Test to locate the local maxima and minima. What are the absolute maxima and minima?

(3) Sketch a graph of a function that is continuous on $(-\infty, \infty)$ and has the following properties. Use a sign graph to summarize information about the function.

(a) $f'(x) < 0$ and $f''(x) > 0$ on $(-\infty, 0)$; $f'(x) < 0$ and $f''(x) > 0$ on $(0, \infty)$.

(b) $f'(x) < 0$ and $f''(x) < 0$ on $(-\infty, 0)$; $f'(x) < 0$ and $f''(x) < 0$ on $(0, \infty)$.

(4) Second Derivative Problems:

(a) Determine the intervals on which the function $f(x) = \frac{1}{1+x^2}$ is concave up or concave down. Identify any inflection points.

(b) Locate the critical points of the function $g(x) = \frac{x^4}{2-12x^2}$. Then use the Second Derivative Test to determine (if possible) whether they correspond to local maxima or minima.