

This test consists of 100 points and 4 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

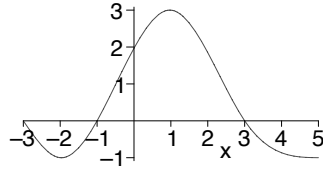
- (15) 1. Find the absolute maximum and absolute minimum of f on the interval $[-5, 1]$ for

$$f(x) = 2x^3 + 15x^2 + 24x$$

- (15) 2. Find and identify the local extrema of

$$f(x) = (x + 3)^4(x - 3)^3$$

- (10) 3. The following is the graph of the derivative f' of a function f on the interval $[-3, 5]$. On what intervals is the graph of f increasing and on what intervals is the graph of f decreasing? (BE CAREFUL)



- (15) 4. Suppose that x and y are positive numbers with $x + y = 8$. Find the maximum value of $xy(x - y)$

- (15) 5. Sketch the graph of

$$y = \frac{x - 4}{(x - 1)^{3/2}}$$

To help you do this, I have simplified the first and second derivatives below.

$$y' = \frac{7 - x}{2(x - 1)^{5/2}}$$

$$y'' = \frac{3(x - 11)}{4(x - 1)^{7/2}}$$

- (15) 6. Suppose $f'(x) > 0 \quad \forall x \in [a, b]$ Let $x, y \in (a, b)$ with $x < y$. Use the mean value theorem to prove $f(x) < f(y)$.

- (15) 7. Evaluate

$$\lim_{x \rightarrow 0} \frac{\sin^{-1}(2x^2)}{x^2}$$