

Exercise 29

Differentiate f and find the domain of f .

$$f(x) = \ln(x^2 - 2x)$$

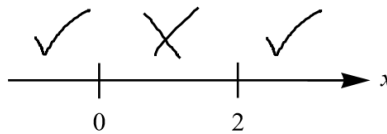
Solution

Recognize that only the logarithm of a positive number can be taken.

$$x^2 - 2x > 0$$

$$x(x - 2) > 0$$

The critical points are then 0 and 2. Partition the number line at these numbers and then test whether the inequality is true within each of the intervals.



Therefore, the domain of the function is

$$(-\infty, 0) \cup (0, \infty).$$

Take the derivative of the function with respect to x by using the chain rule.

$$\begin{aligned} f'(x) &= \frac{d}{dx} [\ln(x^2 - 2x)] \\ &= \frac{1}{x^2 - 2x} \cdot \frac{d}{dx}(x^2 - 2x) \\ &= \frac{1}{x^2 - 2x} \cdot (2x - 2) \\ &= \frac{1}{x(x - 2)} \cdot 2(x - 1) \\ &= \frac{2(x - 1)}{x(x - 2)} \end{aligned}$$