

MCS21 Homework 22

Do all work on a separate sheet of paper.

1. Let $f(x) = \begin{cases} x^2, & x \leq 1 \\ \sqrt{x}, & x > 1 \end{cases}$

Determine whether f is differentiable at $x = 1$. If so, find the value of the derivative there.

2. Let $f(x) = \begin{cases} x^3 + \frac{1}{16}, & x < \frac{1}{2} \\ \frac{3}{4}x^2, & x \geq \frac{1}{2} \end{cases}$

Determine whether f is differentiable at $x = \frac{1}{2}$. If so, find the value of the derivative there.

3. Let $f(x) = \begin{cases} 5x^3 + 2, & x \leq -1 \\ -x^2 + 13x, & x > -1 \end{cases}$

Determine whether f is differentiable at $x = -1$. If so, find the value of the derivative there.

4. Let $f(x) = |x + 3|$.

At what value(s) of x , if any, is f not differentiable? Justify your answer.

5. If $f(x) = \frac{6x^{10} - 2015x^2}{(x-2)(x+3)}$, find $f'(2)$.

6. If $u(5) = -3$, $u'(5) = 1$, $v(5) = 7$, and $v'(5) = -4$, find $h'(5)$ if $h(x) = \frac{u(x)}{v(x)}$

7. The graph of the function f shown in the figure below has a vertical tangent at the point $(2, 0)$ and horizontal tangents at the points $(1, -1)$ and $(3, 1)$. State all values of x , $-2 < x < 4$, at which f is not differentiable.

