

MCS21 Homework 23

Do all work on a separate sheet of paper.

1. Let $f(x) = \begin{cases} 3x^2 + 4x & x \leq 1 \\ 2x^3 + bx + c & x > 1 \end{cases}$

Find the values of b and c so that $f(x)$ is differentiable at $x = 1$.

2. Let $f(x) = \begin{cases} ax^2 + 10 & x < 2 \\ x^2 - 6x + b & x \geq 2 \end{cases}$

Find the values of a and b so that $f(x)$ is differentiable at $x = 2$.

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

Find the values of k and b so that $f(x)$ is differentiable at $x = 1$.

4. Find $\frac{dy}{dx}$ in simplest form.

(a) $y = \sqrt[5]{x} + \sqrt[3]{x} - \sqrt{x^5} + 5x^{\frac{19}{5}}$

(c) $y = \frac{x^2 + 1}{x^3 - 5}$

(b) $y = \frac{(x^3 + 1)\sqrt{x}}{x^2}$,

(d) $y = \frac{x^2 + 1}{4}$

5. If $u(5) = -3$, $u'(5) = 1$, $v(5) = 7$, and $v'(5) = -4$, find $h'(5)$ if:

(a) $h(x) = \frac{x^3 + 1}{v(x)}$

(b) $h(x) = \sqrt{x} \cdot u(x)$