SOLUTIONS

MCV4U Quiz #2 Differentiation Rules

Name .....

1. Use the first principle to find the derivative of $y=\frac{x}{x-2}$. [4 marks]

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}=\lim_{h\to 0}\frac{\frac{x+h}{x+h-2}-\frac{x}{x-2}}{h}$$

$$=\lim_{h\to 0}\frac{x^2-2x+hx-2h-x^2-xh+2x}{(x+h-2)(x-2)h}=\lim_{h\to 0}\frac{-2h}{h(x+h-2)(x-2)h}$$

$$f'(x)=\frac{-2}{(x-2)^2}$$

2. Analyze the differentiability of ~~$y=x^{4/3}$~~ $y=x^{4/5}$. [4 marks]

$$y'=\frac{4}{5}x^{-\frac{1}{5}}=\frac{4}{5\sqrt[5]{x}}$$

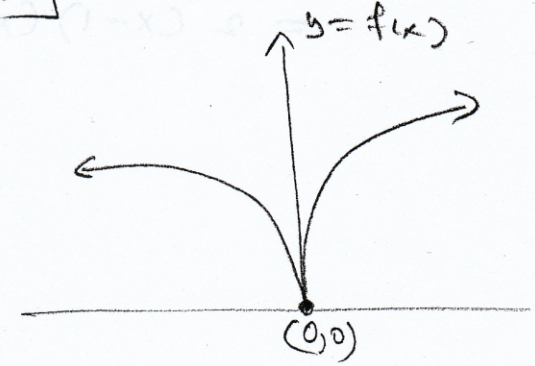
$y=f(x)$ is differentiable over $\mathbb{R}\setminus\{0\}$

$y=f(x)$ is not differentiable at $x=0$

[cusp point at $(0,0)$]

$\lim_{x\to 0^-} f'(x)=-\infty$

$\lim_{x\to 0^+} f'(x)=+\infty$



2. Differentiate. Do not simplify. [6 marks]

[2] a) $f(x)=5x^3-3x^2+2x+5$

$$f'(x) = 15x^2 - 6x + 2$$

[2] b) $f(x)=\sqrt{x}(x^2-1)$

$$f'(x) = \frac{1}{2\sqrt{x}}(x^2-1) + \sqrt{x}(2x)$$

[2] c) $f(x)=(x-1)^2(x^2+2)^3$

$$f'(x) = 2(x-1)(x^2+2)^3 + (x-1)^2(3)(x^2+2)^2(2x)$$

$$= 2(x-1)(x^2+2)^3 + 6x(x-1)^2(x^2+2)^2$$