

22 Sept 2019

p. 129 137) $f(x) = x|x| = \begin{cases} -x^2 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ x^2 & \text{if } x > 0 \end{cases}$

$$f'(x) = \begin{cases} -2x & \text{if } x < 0 \\ ? & \text{if } x = 0 \\ 2x & \text{if } x > 0 \end{cases}$$

$$f'_+(0) = 2(0) = 0$$

$$f'_-(0) = -2(0) = 0$$

$$\therefore f'(0) = 0$$

$$f'(x) = \begin{cases} -2x & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 2x & \text{if } x > 0 \end{cases}$$

135) $f(x) = ax^2 + bx + c$

$$f'(x) = 2ax + b$$

$$f'(1) = 4a + b = 10$$

$$y = 10(x-1)$$

$$y = 10x - 10$$

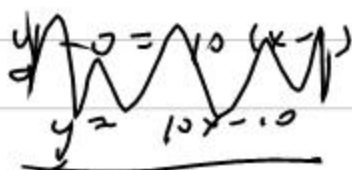
$$a = 3$$

$$b = -2$$

$$c = -1$$

M = 10 at (2, 7)

K = 0 at (1, 0)



$$f(1) = a + b + c = 20$$

$$f(2) = 4a + 2b + c = 7$$

$$3a + b = 7$$

$$-4a - b = -10$$

$$\hline -a = -3$$

120) ~~$f(x) = x^m$~~ $f(x) = \frac{1}{x} = x^{-1}$

$$y' = -1x^{-2} = -\frac{1}{x^2}$$

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

$$y''' = (-1)(-2)(-3)x^{-4} = -\frac{6}{x^4}$$

$$f^{(n)}(x) = \frac{(-1)^n n!}{x^{n+1}}$$

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$$f(x) = x^4 - 3x^2 + 2$$

$$(x^2 - 1)(x^2 + 2) = 0$$

$$x^2 = 1 \quad x^2 = 2$$

roots: 1, -1, $\sqrt{2}$, $-\sqrt{2}$

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$$f'(x) = 4x^3 - 6x$$

$$f'(1) = 4 - 6 = -2$$

$$f(1) = 1 - 3 + 2 = 0$$

$y = -2(x-1)$

// to $y = -2x + 4$

$$4x^4 + 4x - 2 = 0$$

$$2(2x^4 + 2x - 1) = 0$$

$$x = \frac{-2 \pm \sqrt{4+8}}{4}$$

$$4x^3 - 6x = -2$$

$$4x^3 - 6x + 2 = 0$$

1	4	0	-6	2
	4	4	-2	
	4	4	-2	

$$\frac{-2 \pm \sqrt{28}}{4}$$

$\frac{-1 \pm \sqrt{7}}{2}, 1$

Continued from 21 Sept

$$y = \sqrt[3]{\sin^3(x^2 + 2x)}$$

$$y = \sqrt[3]{w} \quad w = u^3 \quad u = \sin \theta \quad \theta = x^2 + 2x$$

$$\frac{dy}{dx} = \frac{dy}{dw} \cdot \frac{dw}{du} \cdot \frac{du}{d\theta} \cdot \frac{d\theta}{dx}$$

$$\frac{1}{2\sqrt{w}} \cdot 3u^2 \cos \theta (2x + 2)$$

$$\frac{dy}{dx} = \frac{3(\sin(x^2+2x))^2 \cos(x^2+2x)(2x+2)}{2\sqrt{(\sin(x^2+2x))^3}}$$

$$\frac{3(x+1) \sin^2(x^2+2x) \cos(x^2+2x)}{2\sqrt{\sin^3(x^2+2x)}}$$

$$y = \sqrt[3]{\sin^3(x^2 + 2x)}$$

$$y' = \frac{3(\sin^2(x^2+2x))(\cos(x^2+2x))(2x+2)}{2\sqrt{\sin^3(x^2+2x)}}$$

$$y = f(g(x)) \quad \text{thw} \quad y' = f'(g(x)) g'(x)$$

$$h(x) = f(g(x))$$

$$h'(c) = \lim_{x \rightarrow c} \frac{f(g(x)) - f(g(c))}{x - c}$$

$$= \lim_{x \rightarrow c} \left[\frac{f(g(x)) - f(g(c))}{g(x) - g(c)} \cdot \frac{g(x) - g(c)}{x - c} \right]$$

$$= \lim_{x \rightarrow c} \frac{f(g(x)) - f(g(c))}{g(x) - g(c)} \cdot \lim_{x \rightarrow c} \frac{g(x) - g(c)}{x - c}$$

$$\text{thw } \begin{matrix} g(x) = u \\ g(c) = b \end{matrix} \quad \lim_{u \rightarrow b} \frac{f(u) - f(b)}{u - b} \cdot \lim_{x \rightarrow c} \frac{g(x) - g(c)}{x - c}$$

$$f'(b) g'(c)$$

$$f'(g(c)) g'(c)$$

$$\therefore \text{thw } \frac{d}{dx} f(g(x)) = f'(g(x)) g'(x)$$