Oct 20, 2017 Notes

① $h(x) = \frac{f(x)}{g(x)} + x$

$\frac{gf' - fg'}{g^2} + 1$

② $r(x) = (-2f(x))g(x)$ — $-2f(x)$

$r'(x) = -2f(x) \cdot g'(x) + g(x) \cdot (-2f'(x))$

T.L. at $x = 5$

$r(5) =$

$r'(5) =$

$y - y_1 = m(x - x_1)$

③ $r(x) = g(g(x))$ $\quad \frac{d}{dx}[g(g(x))]$

$r'(x) = g'(g(x)) \cdot g'(x)$

$r'(3) = g'(g(3)) \cdot g'(3)$

$g'(8) \cdot -5$

$4(-5) = -20$

(4) $\frac{d}{dx}\left[\frac{1}{\sqrt{f(2x)}}\right]$ $\left(f(2x)\right)^{-\frac{1}{2}}$

$-\frac{1}{2}\left(f(2x)\right)^{-3/2} \cdot f'(2x) \cdot 2$

$\frac{-f'(2x)}{\left(f(2x)\right)^{3/2}}$ $\frac{-f'(2x)}{\sqrt{\left(f(2x)\right)^3}}$

(5) $f(x) = \cos^4\left(\frac{x}{2}\right) = \left(\cos\left(\frac{x}{2}\right)\right)^4$

$f'(x) = 4\left(\cos\left(\frac{x}{2}\right)\right)^3 \cdot \left(-\sin\left(\frac{x}{2}\right)\right) \cdot \frac{1}{2}$

$= -2\sin\left(\frac{x}{2}\right)\cos^3\left(\frac{x}{2}\right)$

$= -\sin x \cdot \cos^2\left(\frac{x}{2}\right)$

(6) $y = x^4\sqrt{3x+1}$

$$\frac{dy}{dx} = x^4 \cdot \frac{1}{2}(3x+1)^{-1/2} \cdot 3 + \sqrt{3x+1} \cdot 4x^3$$

$$= \frac{3x^4}{2\sqrt{3x+1}} + 4x^3\sqrt{3x+1} \cdot \frac{2\sqrt{3x+1}}{2\sqrt{3x+1}}$$

$$= \frac{3x^4 + 8x^3(3x+1)}{2\sqrt{3x+1}}$$

$$\frac{3x^4 + 24x^4 + 8x^3}{2\sqrt{3x+1}}$$

$$\frac{x^3(27x+8)}{2\sqrt{3x+1}}$$

Homework Due Monday

AP Problem (this Paper)
Pg 161 #51, 52, 56 e, f, g, h
#73
Pg 153 #81, 82
Find Equation of Tangent line to $f(x) = \sec(\frac{x}{2})$ at $x = \frac{\pi}{3}$

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Question 6

Let f be the function defined by

$$f(x) = \begin{cases} \sqrt{x+1} & \text{for } 0 \le x \le 3 \\ 5 - x & \text{for } 3 < x \le 5. \end{cases}$$

(a) Is f continuous at $x = 3$? Explain why or why not.

(b) Find the Avg rate of change of $f(x)$ on the closed interval $0 \le x \le 5$.

(c) Suppose the function g is defined by

$$g(x) = \begin{cases} k\sqrt{x+1} & \text{for } 0 \le x \le 3 \\ mx + 2 & \text{for } 3 < x \le 5, \end{cases}$$

where k and m are constants. If g is differentiable at $x = 3$, what are the values of k and m?