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Lista Semana 10

1) a) $\frac{d(y^5 + y)}{dx} = \frac{d(x)}{dx}$

$5y^4 \cdot \frac{dy}{dx} + \frac{dy}{dx} = 1$

$\frac{dy}{dx}(5y^4 + 1) = 1$

$\frac{dy}{dx} = \frac{1}{5y^4 + 1}$

7c) $\lim_{x \to \infty} \frac{\ln x}{4x^2} \Rightarrow \lim_{x \to \infty} \frac{\frac{1}{x}}{8x} = 0$

2) $\frac{d(x^2 + 4y^3)}{dx} = \frac{d(0)}{dx}$

$2x + 12y^2 \cdot \frac{dy}{dx} = 0$

$12y^2 \cdot \frac{dy}{dx} = -2x$

$\frac{dy}{dx} = \frac{-2x}{12y^2} = \frac{-x}{6y^2}$ $\left.\frac{dy}{dx}\right|_{x=1} = \frac{-1}{6 \cdot \frac{1}{4}} = -\frac{1}{2}$

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

$2y - 1 = -1(x - 1)$

$2y - 1 = -x + 1$

$2y = -x + 2$

$\boxed{y = -\frac{1}{2}x + 1}$

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7b) $\lim_{x\to 0} \frac{x - \operatorname{sen} x}{x^2}$

$\lim_{x\to 0} \frac{1 - \cos x}{2x}$

$\lim_{x\to 0} \frac{\operatorname{sen} x}{2} = \frac{0}{2} = 0$

7a) $\lim_{x\to 1} \frac{3x^3 + x - 4}{4x^2 - 4}$

$\lim_{x\to 1} \frac{15x^4 + 1 - 0}{8x - 0}$

$\lim_{x\to 1} \frac{15x^4 + 1}{8x} = \frac{16}{8} = 2$

7d) $\lim_{x\to 0^+} x^2 \cdot \ln x$

$\lim_{x\to 0^+} \frac{\ln x}{\frac{1}{x^2}} \Rightarrow \frac{\ln x}{x^{-2}}$

$\lim_{x\to 0^+} \frac{\frac{1}{x}}{-2x^{-3}}$

$\lim_{x\to 0^+} \frac{\frac{1}{x}}{\frac{-2}{x^3}}$

$\lim_{x\to 0^+} \frac{1}{x} \cdot \frac{x^3}{-2} = 0$

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b) $\frac{d}{dx}(x^2+y^2) = \frac{d(c)}{dx}$

$2x \cdot \frac{dx}{dx} + 2y \cdot \frac{dy}{dx} = 0$

$\frac{dy}{dx} + \frac{dy}{dx} = \frac{2x}{8y}$

$\frac{dy}{dx} = -\frac{x}{4y}$

c) $\frac{d(xy)}{dx} + \frac{d(y^3)}{dx} = \frac{d(x)}{dx}$

$y + x\frac{dy}{dx} + 3y^2 \cdot \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{1-y}{x+3y^2}$

3a) $f'(x) = 2x - 3$

$f'(0) = -3$

$y - 0 = -3(x-0)$

$y = -3x$ tg

$y - 0 = \frac{1}{3}(x-0)$

$y = \frac{1}{3}x$ normal

3b) $g'(x) = x^{-2} \Rightarrow -2x^{-3}$

$g'(1) = -2 \cdot 1^{-3} \Rightarrow -2 \cdot \frac{1}{1} = -2$

$y - 1 = -2(x-1)$

$y - 1 = -2x + 2$

$y = -2x + 3$ tg

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

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

$y = \frac{1}{2}x + \frac{1}{2}$ normal

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4) $A = \pi R^2$ $\quad \frac{dA}{dt} = \frac{d(\pi R^2)}{dt}$ $\quad 10 = 2R \cdot \pi \cdot \frac{dr}{dt} \Rightarrow \frac{dr}{dt} = \frac{1}{\pi}$ cm/min

5) $V = \frac{4}{3}\pi R^3$ $\quad \frac{dV}{dt} = \frac{d(\frac{4}{3}\pi R^3)}{dt} \cdot 4\pi R^2 \frac{dr}{dt} \Rightarrow 9\pi \cdot 3^2 \cdot 2 \Rightarrow 162\pi$

6) $x^2 + y^2 = 8^2$

$\frac{d(x^2+y^2)}{dt} = \frac{d(8^2)}{dt}$

$2x \cdot \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$

$2 \cdot 3 + y \frac{dy}{dt} = 0 \Rightarrow 6 + \sqrt{55} \cdot \frac{dy}{dt} = 0$

$\frac{dy}{dt} = \frac{6}{\sqrt{55}} \cdot \frac{\sqrt{55}}{\sqrt{55}} = -\frac{6\sqrt{55}}{55}$ m/s.

$\begin{cases} 9 + y^2 = 64 \\ y^2 = 55 \\ y = \sqrt{55} \end{cases}$