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Universidade Federal da Fronteira Sul - UFFS
Curso: Ciência da Computação
Disciplina: Cálculo 1
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① $f(x) = 4 - x^2$; $f'(-3)$, $f'(0)$, $f'(1)$

$f(x) = \frac{d}{dx}(4) - \frac{d}{dx}(x^2) \rightarrow \frac{d}{dx}(x^2) = 2x \rightarrow 0 - 2x \rightarrow -2x$

- $f'(-3) = -2 \cdot -3 = 6$
- $f'(0) = -2 \cdot 0 = 0$
- $f'(1) = -2 \cdot 1 = -2$

II)

$g(t) = \frac{1}{t^2}$; $g'(-1)$, $g'(2)$, $g'(\sqrt{3})$

$g(t) = \frac{d}{dt}\left(\frac{1}{t^2}\right) = \frac{2}{t^3} \rightarrow \frac{d}{dt}(t^{-2}) \rightarrow -2t^{-2-1} \rightarrow -2/t^3$

- $g'(-1) = -2/-1^3 = 2$
- $g'(2) = -2/2^3 = -2/8 \rightarrow -1/4$
- $g'(\sqrt{3}) = -2/\sqrt{3}^3 \rightarrow -2/\sqrt{3}^3$

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② $f(x) = x + 9/x \quad , \quad x = -3$

$f'(x) = \frac{d}{dx}\left(x + \frac{9}{x}\right) \rightarrow f'(x) = \frac{d}{dx}(x) + \frac{d}{dx}\left(\frac{9}{x}\right)$

$\hookrightarrow f'(x) = 1 - 9 \cdot 1/x^2 \rightarrow \boxed{f'(x) = 1 - \frac{9}{x^2}}$

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3 a) Qual é o seu deslocamento depois dos primeiros 4 segundos.

$t=4 \rightarrow x(t) = 3t^2 - t^3$

$$x(t) = 3(4)^2 - (4)^3 = \boxed{-16 \text{ metros}}$$

b) Qual é a velocidade da partícula ao terminar cada um dos 4 primeiros segundos

Primeiros 4 segundos $\rightarrow x(t) = 6t - 3t^2$

$x(0) = 6(0) - 3(0)^2 = 0$ m/s $\rightarrow$ segundo 0

$x(1) = 6(1) - 3(1)^2 = 3$ m/s $\rightarrow$ segundo 1

$x(2) = 6(2) - 3(2)^2 = 0$ m/s $\rightarrow$ segundo 2

$x(3) = 6(3) - 3(3)^2 = -9$ m/s $\rightarrow$ segundo 3

$x(4) = 6(4) - 3(4)^2 = -24$ m/s $\rightarrow$ segundo 4

c) Qual é a aceleração da partícula em cada um dos 4 primeiros segundos

aceleração $\rightarrow x(t) = 6 - 6t$

$x(0) = 6 - 6(0) = 6$ m/s^2 $\rightarrow$ segundo 0

$x(1) = 6 - 6(1) = 0$ m/s^2 $\rightarrow$ segundo 1

$x(2) = 6 - 6(2) = 6$ m/s^2 $\rightarrow$ segundo 2

$x(3) = 6 - 6(3) = -12$ m/s^2 $\rightarrow$ segundo 3

$x(4) = 6 - 6(4) = -18$ m/s^2 $\rightarrow$ segundo 4

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④ $f(x) = 10(3x^2+7x-3)^{10}$

$f'(x) = 10 \cdot 10(3x^2+7x-3)^9 \cdot (6x+7)$

$f'(x) = 100 \cdot (6x+7)(3x^2+7x-3)^9$

$f(t) = (7t^2+6t)^7(3t-1)^4$

$f'(t) = 7(7t^2+6t)^6 \cdot (14t+6) \cdot (3t-1)^4 + (7t^2+6t)^7 \cdot 4(3t-1)^3 \cdot 3$

$f'(t) = (7t^2+6t)^6 \cdot (3t-1)^3 [7(14t+6)(3t-1) + 12(7t^2+6t)]$

$f(x) = \sqrt[3]{(3x^2+6x-2)^2}$

$f(x) = (3x^2-6x-2)^{2/3}$

$f'(x) = \frac{2}{3}(3x^2-6x-2)^{-1/3} \cdot (6x-6)$

$f'(x) = \frac{2(6x-6)}{3\sqrt[3]{3x^2-6x-2}}$

$f(t) = \sqrt{\frac{2t+1}{t-1}} \Rightarrow f(t) = \left(\frac{2t+1}{t-1}\right)^{1/2} \Rightarrow f'(t) = \frac{2t-2-2t-1}{(t-1)^2} \cdot \frac{1}{2 \cdot \sqrt{\frac{2t+1}{t-1}}}$

$\Rightarrow f'(t) = \frac{3 \cdot \sqrt{t-1}}{2 \cdot (t-1)^2 \cdot \sqrt{2t+1}} \Rightarrow f'(t) = \frac{3 \cdot (t-1)^{1/2-2}}{2 \cdot \sqrt{2t+1}}$

$\Rightarrow f'(t) = -\frac{3}{2} \cdot \sqrt{\frac{1}{(t-1)^3 \cdot (2t+1)}}$

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$f(x) = 2^{3x^2+6x}$

$f'(x) = \ln(2) \cdot 2^{g} \cdot \frac{d}{dx}(3x^2+6x)$

$f'(x) = \ln(2) \cdot 2^{g} \cdot (3 \cdot 2x + 6)$

$f'(x) = \ln(2) \cdot 2^{3x^2+6x} \cdot (3 \cdot 2x + 6) \to f'(x) = \ln(2) \cdot 2^{3x^2+6x} \cdot (6x+6)$

$f(t) = e^{t/2}(t^2+5t)$

$f'(t) = (e^{t/2})' \cdot (t^2+5t) + (e^{t/2}) \cdot (t^2+5t)'$

$f'(t) = (e^{t/2}) \cdot \left(\frac{t^2+9t}{2} + 5\right)$

$f(s) = \log_3 \sqrt{s+1} \to \frac{1}{\sqrt{s+1}} \frac{d}{ds}(\sqrt{s+1})$

$\frac{d}{ds}(\sqrt{s+1}) = \frac{1}{2\sqrt{s+1}} \to \frac{1}{\ln(3)} \cdot \frac{1}{\sqrt{s+1}} \cdot \frac{1}{2\sqrt{s+1}} \to \frac{1}{2 \cdot \ln(3)(s+1)}$

$f(u) = \cos(\pi/2 - u)$

$f(x) = \cos(v) \to v = \pi/2 - u$

$f'(x) = -\text{sen}(\pi/2 - u) \cdot (-1)$

$f'(x) = \text{sen}(\pi/2 - u)$

$f(x) = \text{sen}^3(3x^2+6x)$

$\frac{d}{du}(u^3) = 3u^2 \to \frac{d}{dj}(\text{sen}(j)) \frac{d}{dx}(3x^2+6x)$

$\to f'(x) = 3\,\text{sen}^2(3x^2+6x)\cos(3x^2+6x)(6x+6)$

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$f(x) = \frac{3\sec^2 x}{x} \rightarrow 3\frac{d}{dx}\left(\frac{\sec^2 x}{x}\right) \rightarrow \frac{d}{dx}(\sec^2 x) = 2\sec^2(x)tg(x)$

$3 \cdot \frac{2\sec^2(x)\,tg(x)x - 1 \cdot \sec^2 x}{x^2} \rightarrow \frac{3(2x\sec^2(x)tg(x) - \sec^2(x))}{x^2}$

$f(\theta) = -\operatorname{cosec}^2 \theta^3$

$2\operatorname{cosec}(\theta^3)\frac{d}{d\theta}(\operatorname{cosec}(\theta^3))$

$\frac{d}{d\theta}(\operatorname{cosec}(\theta^3))(-\operatorname{cotg}(\theta^3)\operatorname{cosec}(\theta^3) \cdot 3\theta^2) = 6\theta^2 \operatorname{cosec}^2(\theta)^3 \operatorname{cotg}\theta^3$

5 $f(x) = e^{-x}\cos 3x$

$f'(x) = -x e^{-x}\cos(3x) + \cos(3x)' e^{-x}$

$f'(x) = \frac{-1}{e^x}\cos(3x) - 3\operatorname{sen}(3x)e^{-x}$

$f'(x) = -\frac{\cos(3x)}{e^x} - \frac{3\operatorname{sen}(3x)}{e^x}$

$f'(x) = \frac{-\cos(3x) - 3\operatorname{sen}(3x)}{e^x}$

$f'(0) = -\frac{\cos 0° - 3\operatorname{sen} 0°}{e^0} \rightarrow \frac{-1-0}{1} = -1$

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(6) $f(x) = x . e^{-x}$

$f'(x) = -x . e^{-x} \rightarrow xy' = (1-x)y \rightarrow y - yx$

$f'(x) = -x^2 . e^{-x} = xe^{-x} - x^2 . e^{-x}$

$f'(x) = x . e^{-x} = 0$

(7) $b = 10^6 + 10^4 t - 10^3 t^2$

$$b'(t) = \lim_{\Delta t \to 0} \frac{b(t+\Delta t) - b(t)}{\Delta t} = \lim_{\Delta t \to 0} \frac{10^6 + 10^4(t+\Delta t) - 10^3(t+\Delta t)^2 - 10^6 + 10^4 - 10^3 t^2}{\Delta t}$$

$$\lim_{\Delta t \to 0} \frac{10^4 \Delta t - 10^3 (t^2 + 2t\Delta t + (\Delta t)^2) + 10^3 t^2}{\Delta t}$$

$$\lim_{\Delta t \to 0} \frac{10^4 \Delta t - 10^3 . 2t\Delta t - 10^3 (\Delta t)^2}{\Delta t}$$

$$\lim_{\Delta t \to 0} \frac{\Delta t (10^4 - 10^3 . 2t - 10^3 \Delta t)}{\Delta t}$$

$$\lim_{\Delta t \to 0} 10^4 - 10^3 . 2t - 10^3 \Delta t \rightarrow 10^4 - 10^3 . 2t$$

- a) $b'(0) = 10^4 - 10^3 . 2 . 0 \rightarrow 10^4$
- b) $b'(5) = 10^4 - 10^3 . 2 . 5 \rightarrow 0$
- c) $b'(10) = 10^4 - 10^3 . 2 . 10 \rightarrow -10^4$