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BVN Giải tích.

1, $f(x) = (x-1)(x-2)^2(x-3)^3$

$\Rightarrow f'(x) = 6x^5 - 70x^4 + 320x^3 - 714x^2 + 774x - 324$

$\Rightarrow f'(1) = 1,2324$, $f'(2) = 2$, $f'(3) = 3$.

2, $f(x) = x + (x-1)\arcsin\sqrt{\frac{x}{x+1}}$

$\Rightarrow f'(x) = x + x.\arcsin\left(\frac{\sqrt{x+1}}{x+1}\right) - \arcsin\left(\frac{\sqrt{x+1}}{x+1}\right)$

$\Rightarrow f'(1) = 1$

3, a, $y = x + \sqrt{x} + \sqrt[3]{x}$

$\Rightarrow y' = 1 + \frac{1}{2x^{1/2}} + \frac{1}{3x^{2/3}}$

b, $y = \frac{1}{x} + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}$

$\Rightarrow y' = -\frac{1}{x^2} - \frac{1}{2x^{3/2}} - \frac{1}{3x^{4/3}}$

c, $y = \sqrt[3]{\frac{1+x^3}{1-x^3}}$

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

d, $y = \frac{\sin^2 x}{\sin x^2}$.

$\Rightarrow y' = \frac{\sin(x^2)\sin(2x) - 2\sin(x)\cos(x^2)}{\sin^2(x^2)}$.

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g) $y = \frac{1}{\cos^n x}$

$\Rightarrow y = \frac{n \sin x}{(\cos^n x)^2}$

h) $y = \operatorname{tg} \frac{x}{2} - \operatorname{cotg} \frac{x}{2}$.

$\Rightarrow y' = \frac{1}{\cos^2(x/2)} + \frac{1}{\sin^2(x/2)}$

g) $y = x^{1/x}$

$\Rightarrow y' = -\frac{x}{x^2} \cdot x^{1/x} \cdot \ln x$.

h) $y = \ln(x + \sqrt{1+x^2})$.

$\Rightarrow y' = \frac{(1+x^2)^{1/2} + x}{x^2 + x(1+x^2)^{1/2} + 1}$

i) $y = e^x \ln(\sin x)$

$\Rightarrow y' = e^x \operatorname{cotg}(x) + e^x \ln(\sin(x))$.

j) $y = e^{\operatorname{arctg} x}$

$\Rightarrow y' = \frac{e^{\operatorname{arctg} x}}{x^2+1}$

4) $y = x^3 - 3x^2 - x + 5$ tại $A(3,2)$

$\Rightarrow y' = 3x^2 - 6x - 1$

$\Rightarrow y'(3) = 8$

$\Rightarrow$ pt tiếp tuyến tại $A(3,2)$ là:

$\Delta: y - y_0 = y'(x - x_0) + y_0$

$= 8(x-3) + 2 = 8x - 22$.

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5 a, $y = \frac{1}{x}$

$\Rightarrow dy = \frac{-1}{x^2} dx$

b, $y = \frac{1}{a} \arctan\left(\frac{x}{a}\right)$ vs $a \neq 0$.

$\Rightarrow dy = \frac{1}{a^2 + x^2} dx$

c, $y = \frac{1}{2a} \ln\left(1 + \sqrt{x^2 + a^2}\right)$ với $a \neq 0$.

$\Rightarrow dy = \frac{x}{2a(x^2 + a^2)^{1/2}\left(1 + (x^2 + a^2)^{1/2}\right)} dx$.

d, $y = \arcsin \frac{x}{a}$ vs $a \neq 0$.

$\Rightarrow dy = \frac{1}{a\sqrt{1 - \frac{x^2}{a^2}}} dx$

e, $y = x e^x$

$\Rightarrow dy = x e^x + e^x$.

f, $y = \sqrt{a^2 + x^2}$

$\Rightarrow dy = \frac{x}{(a^2 + x^2)^{1/2}} dx$.

g, $y = \frac{x}{\sqrt{1 - x^2}}$

$\Rightarrow dy = \frac{1}{(-x^2 + 1)^{3/2}} dx$.

h, $y = \ln(1 - x^2) \Rightarrow dy = -\frac{2x}{1 - x^2} dx$.

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6, a, $\frac{d(x^3 - 12x^5 - x^9)}{d(x^3)}$

$= \frac{3x^2 - 12x^5 - 9x^8}{3x^2 dx}$

$= 1 - 4x^3 - 3x^6$.

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

c, $\frac{d(\sin x)}{d(\cos x)} = \frac{\cos x\, dx}{-\sin x\, dx} = -\cot x$.

7, Tìm y''

a, $y = x\sqrt{1+x^2}$

$\Rightarrow y'' = \frac{x(2x^2+3)}{(x^2+1)^{3/2}}$

b, $y = \frac{x}{\sqrt{x - x^2}}$

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

c, $y = e^{-x^2}$

$\Rightarrow y'' = 4x^2 e^{-x^2} - 2e^{-x^2}$

d, $y = \ln(7(x))$

$\Rightarrow y'' = 0$.

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8) a. $x = 2t - t^2$, $y = 3t - t^3$

$\Rightarrow \begin{cases} x'(t) = 2 - 2t \\ y'(t) = 3 - 3t^2 \end{cases} \Rightarrow \begin{cases} x''(t) = -2 \\ y''(t) = -6t \end{cases}$

Ta có: $y'(x) = \frac{y'(t)}{x'(t)}$

$y''(x) = \frac{y''(t)\,x'(t) - x''(t)\,y'(t)}{(x'(t))^3}$

Vì: $y'(x) = \frac{y'(t)}{x'(t)} = \frac{3-3t^2}{2-2t} = \frac{3}{2}(1+t)$.

$y''(x) = \frac{-6t(2-2t) - (-2)\cdot(3-3t^2)}{(2-2t)^3}$

$= \frac{-12t + 12t^2 + 6 - 6t^2}{8(1-t)^3}$

$= \frac{12t^2 - 12t + 6}{8(1-t)^3}$

b, $x = a\cot(t)$, $y = a\sin(t)$.

$\begin{cases} x'(t) = -a\csc^2(t) \\ y'(t) = a\cos(t) \end{cases}$

$\Rightarrow \begin{cases} x''(t) = 2a\csc^2(t)\cot(t) \\ y''(t) = -a\sin(t) \end{cases}$

Vì: $y'(x) = \frac{y'(t)}{x'(t)} = \frac{a\cos(t)}{-a\csc^2(t)} = -\sin(t)\csc^2(t)$

$y''(x) = \frac{-a\sin(t)\cdot(-a)\csc^2(t) - 2a\csc^2(t)\cot(t)\,a\cos(t)}{(-a\csc^2(t))^3}$

$= -\frac{\sin^3(t)}{a} + \frac{2\cos^2(t)\sin^3(t)}{a^2}$

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c) $x = a(t - \sin t)$, $y = a(1 - \cos t)$

$\Rightarrow \begin{cases} x'(t) = a - a\cos(t) \\ y'(t) = a\sin(t) \end{cases} \Leftrightarrow \begin{cases} x''(t) = a\sin(t) \\ y''(t) = a\cos(t) \end{cases}$

$$y'(x) = \frac{y'(t)}{x'(t)} = \frac{a\cos(t)}{a\sin(t)} = \frac{1-\cos(t)}{\sin(t)}.$$

$$y''(x) = \frac{a\cos(t)\cdot a - a\cos(t) - a\sin(t)\cdot a\sin(t)}{(a - a\cos(t))^3}$$

$$= \frac{\cos(t) - \frac{\cos(t)}{a} - \sin^2(t)}{a(1-\cos(t))^3}$$