1/

1) $\frac{d}{dx}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$

Quotient rule

$$\frac{\frac{d}{dx}(\sqrt{x}-1)(\sqrt{x}+1)-\frac{d}{dx}(\sqrt{x}+1)(\sqrt{x}-1)}{(\sqrt{x}+1)^2}$$

[redacted]

simplify

$\frac{d}{dx}(\sqrt{x}-1) \rightarrow (\sqrt{x})-(1) \rightarrow \frac{d}{dx}(\sqrt{x})$

rad rule

$\frac{d}{dx}(x^{\frac{1}{2}}) \rightarrow \frac{1}{2}x^{\frac{1}{2}-1} \rightarrow \frac{1}{2\sqrt{x}}$

$\frac{d}{dx}(1) = 0$

$\frac{d}{dx}(\sqrt{x}+1) = \frac{1}{2\sqrt{x}}$

$$=\frac{\frac{1}{2\sqrt{x}}(\sqrt{x}+1)-\frac{1}{2\sqrt{x}}(\sqrt{x}-1)}{(\sqrt{x}+1)^2}$$

$= \frac{1}{2\sqrt{x}}$

= simplify

$= \frac{\sqrt{x}+1}{2\sqrt{x}} - \frac{\sqrt{x-1}}{2\sqrt{x}}$

$$\frac{\frac{\sqrt{x}+1-(\sqrt{x}+1)}{2\sqrt{x}}}{(\sqrt{x}+1)^2} = \frac{2}{\sqrt{x}(\sqrt{x}+1)^2}$$

answer

1B) $\frac{d}{d\theta}\left(\frac{1-\sec(\theta)}{\tan(\theta)}\right)$

Quotient

$$\frac{\frac{d}{d\theta}(1-\sec(\theta))\tan(\theta) - \frac{d}{d\theta}\tan(\theta))(1-\sec\theta))}{(\tan(\theta))^2}$$

$(1-\sec\theta)$ Sum Diff

$\frac{d}{d\theta}(1) - \frac{d}{d\theta}(\sec(\theta))$

$(1) = 0$

$\frac{d}{d\theta}(\sec(\theta)) =$ Comon Deravitve

$(\sec(\theta)\tan(\theta)$

$0 - \sec(\theta)\tan(\theta)$

$=$

$-\sec(\theta)\tan(\theta)$

$$\frac{d}{d\theta}(\tan(\theta)) = \sec^2(\theta) = \frac{(-\sec(\theta)\tan(\theta))\tan(\theta) - \sec^2(\theta)(1-\sec(\theta))}{\tan^2(\theta)}$$

Simplify

answer :

$$\boxed{= \frac{-\tan^2(\theta)\sec(\theta) - \sec^2(\theta)(1-\sec\theta))}{\tan^2\theta}}$$

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2)

a) $(f+g)'(3)$

~~Consider~~

$(f+g)'(x) = f'(x) + g'(x)$

Sub $x=3$,

$(f+g)'(3) = f'(3) + g'(3)$

$-6+5 = -1$

So

$f+g'(3) = -1$

b) $(f \cdot g)'(x) = f'(x) \cdot g(x) \cdot g'(x) \cdot f(x)$

Sub $x=3$

$(-6) \cdot 2 + 5 \cdot 4$

$= -12 + 20$

$= 8$ therfore $(f \cdot g)'(3)$ is $\boxed{8}$

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2c)

$$\left(\frac{f}{g}\right)'(x) = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{g(x)^2}$$

$$\left(\frac{f}{g}\right)'(3) = \frac{g(3)\cdot f'(3) - f(3)\cdot g'(3)}{g(3)^2}$$

$$= \frac{2\cdot(-6) - 4\cdot 5}{2^2}$$

$$= \frac{-12-20}{4} = \frac{-32}{4} = -8$$

$$\left(\frac{f}{g}\right)'(3) = -8$$

3) $\frac{1}{x^4+x^2+1}$ $\frac{d}{dx}\left(\frac{1}{x^4+x^2+1}\right)$

exp rule

$$\frac{d}{dx}\left((x^4+x^2+1)^{-1}\right)$$

chain rule

$$\frac{d}{du}(u^{-1})\frac{d}{dx}\left((x^4+x^2+1)\right)$$ power rule

$$\frac{d}{du}(u^{-1})$$

$$= -1\cdot u^{-1-1} = \frac{1}{u^2}$$

4)

$$= u^{-\frac{1}{2}} \frac{d}{dx}\left(\left(x^4 + x^2 + 1\right)\right)$$

Sub u

$$-\frac{1}{(x^4+x^2+1)^2} \frac{d}{dx}\left(x^4 + \cancel{2x}^{2} + 1\right)$$

$$\frac{d}{dx}\left(x^4 + x^2 + 1\right)$$ sum/Diff

$$\frac{d}{dx}(x^4) + \frac{d}{dx}(x^2) + \frac{d}{dx}(1)$$

Power rule

$4x^{4-1}$ simp $= 4x^3$

$\frac{d}{dx}(x^2) = 2x$

Power rule

$2x^{2-1} = 2x$

$\frac{d}{dx}(1) = 0$

$= 4x^3 + 2x$

$$-\frac{1}{(x^4+x^2-1)^2} \quad (4x^3+2x)$$

multiply frac

$$-\frac{1\,(4x^3+2x)}{(x^4+x^2+1)^2}$$

answer

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

4)

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

Parallel to $x-2y=2$

$$\frac{2}{(x+1)^2} = \frac{1}{2} \Rightarrow x=-3,1$$

$$y(-3) = \frac{-3-1}{-3+1} = \frac{-4}{-2} = 2$$

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

equation of the Tang lines

$$y-2 = \frac{1}{2}(x+3), \quad y-0 = \frac{1}{2}(x-1)$$

$$y-2 = \frac{1}{2}x+\frac{7}{2}, \quad y = \frac{1}{2}x-\frac{1}{2}$$

5)

$H(\theta) = \theta$

$H'(\theta) = \frac{d}{d\theta}(\theta \cdot \sin\theta)$

$\theta \cdot \frac{d}{d\theta}(\sin\theta) + \sin\theta \frac{d}{d\theta}(\theta)$

Prod rule

$\boxed{H'(\theta) = \theta \cdot \cos\theta + \sin\theta}$

Then

$H''(\theta) = \frac{d}{d\theta}(H'(\theta))$

$= \frac{d}{d\theta}(\theta \cdot \cos\theta + \sin\theta)$

$= \frac{d}{d\theta}\left(\theta \cdot \cos\theta + \frac{d}{d\theta}(\sin\theta)\right)$

$\Downarrow$

$\theta \frac{d}{d\theta}(\cos\theta) + \cos\theta \frac{d}{d\theta}(\theta) + \cos\theta$

$\boxed{H''(\theta) = -\theta\sin\theta + 2\cos\theta}$

6] deriv of $f(x) = \sqrt{x\sqrt{x\sqrt{x}}}$

$f'(x) = f'(x)$

$f'(x) = \sqrt{x\sqrt{x\sqrt{x}}} = f'(x)$

$f'(x) = x$

so $f'(x) = g(x)$ so $f(x) = \int g(x)\,dx$

$f(x) = \int x\,dx$

$\int x\,dx = \int x^a\,dx = \frac{x^{a+1}}{a+1}$ $a \neq -1$

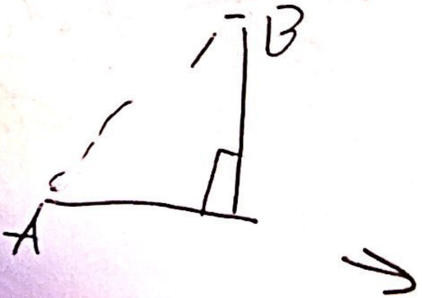
$\frac{x^{1+1}}{1+1} = \frac{x^2}{2} + c'$

$f(x) = \frac{x^2}{2} + C_1$ I think

7.) 25 km/hr A. B. 35 km/hr

150 km

4:00pm



d of A = 35 x 4 = 140 km

d of B = 25 x 4 = 100 km

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Let $AO = x$

let $BO = y$

Distan = $D = \sqrt{x^2 + y^2}$

$$\frac{d(D)}{dt} = \frac{\left(2x\frac{dx}{dt} + 2y\frac{dy}{dt}\right)}{2\sqrt{x^2+y^2}}$$

So at 4 $x = 10$ $y = 100$ $\frac{dx}{dt} = 35$ $\frac{dy}{dt} = 25$

$$\frac{dD}{dt} = \frac{2\times10\times35 + 2\times25\times100}{2\sqrt{(10)^2+(100)^2}} = \frac{700+5000}{200.99}$$

$= 28.36\,km/h$

at 4:00 $= 28.3\,km/h$

Curve $= x^2 + 4xy + y^2 = 13$

Slop $= \frac{dy}{dx} = m$

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

$$\rightarrow 2x + 4\left(x\cdot\frac{dy}{dx} + y\frac{dx}{dx}\right) + \frac{dy^2}{dx}\cdot\frac{dy}{dx} = 0$$

8 Cont.

$$2x + 4x\frac{dy}{dx} + 4y + 2y\frac{dy}{dx} = 0$$

$$\frac{dy}{dx}(4x+2y) = -(2x+4y)$$

$$\frac{-(2x+4y)}{4x+2y} \Rightarrow \frac{dy}{dx} = -\frac{(x+2y)}{2x+y}$$

$(2,1)$ $$\frac{-2+2}{4+1} = -\frac{4}{5} \quad m = -\frac{4}{5}$$

equation of tan line @ $(2,1)$

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

$$y - 1 = \frac{-4}{5}(x-2)$$

$$y = \frac{-4x}{5} + \frac{8}{5} + 1$$

$$y = -\frac{4x}{5} + \frac{13}{5}$$

answer