RD Sharma Solutions Class 12 Maths Chapter 11 Ex 11.2

Chapter: Differentiation

Exercise: 11.2

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Q.1

Solution:

Consider $y = \sin(3x+5)$

Differentiate y with the respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(\sin\left(3x+5\right)\right)$$

$$= \cos(3x+5)\frac{d}{dx}(3x+5)$$

[using chain rule]

$$= \cos\left(3x+5\right)\times\left[3(1)+0\right]$$

$$= 3\cos\left(3x+5\right)$$

Hence the solution is $\boxed{\frac{d}{dx}(\sin(3x+5)) = 3\cos\left(3x+5\right)}$

Q.2

Solution:

Consider $y = \tan^2 x$

Differentiate it with the repect to x,

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

[using chain rule]

$$= 2\tan x \times \sec^2 x$$

Hence the solution is $\boxed{\frac{d}{dx} = \left(\tan^2 x\right)\times\sec^2 x}$

Q.3

Solution:

Consider

$$y = \tan(x^\circ + 45^\circ)$$

$$y = \tan\left\{(x^\circ + 45^\circ)\frac{\pi}{180^\circ}\right\}$$

Differentiate it with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\tan\left\{\left(x^\circ+45^\circ\right)\frac{\pi}{180^\circ}\right\}$$

$$=\sec^2\left\{\left(x^\circ+45^\circ\right)\frac{\pi}{180^\circ}\right\}\times\frac{d}{dx}\left(x^\circ+45^\circ\right)\frac{\pi}{180^\circ}$$

[using chain rule]

$$=\frac{\pi}{180^\circ}\sec^2\left(x^\circ+45^\circ\right)$$

Hence the solution is $\boxed{\frac{d}{dx}=\left(\tan\left(x^\circ+45^\circ\right)\right)=\frac{\pi}{180^\circ}\sec^2\left(x^\circ+45^\circ\right)}$

Q.4

Solution:

Consider $y=\sin(\log x)$

Differentiate it with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\sin\left(\log x\right)$$

$$=\cos(\log x)\frac{d}{dx}(\log x)$$

[using chain rule]

$$=\frac{1}{x}\cos(\log x)$$

Hence the solution is $\boxed{\frac{d}{dx}=(\sin(\log x))=\frac{1}{x}\cos(\log x)}$

Q.5

Solution:

Consider $y=e^{\sin\sqrt{x}}$

Differentiate it with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(e^{\sin\sqrt{x}}\right)$$

$$=e^{\sin\sqrt{x}}\frac{d}{dx}\left(\sin\sqrt{x}\right)$$

[using chain rule]

$$=e^{\sin\sqrt{x}}\times\cos\sqrt{x}\frac{d}{dx}\sqrt{x}$$

[using chain rule]

$$= e^{\sin\sqrt{x}} \times \cos\sqrt{x} \times \frac{1}{2\sqrt{x}}$$

$$= \frac{1}{2\sqrt{x}} \cos\sqrt{x} \times e^{\sin\sqrt{x}}$$

Hence the solution is $\boxed{\frac{d}{dx} = \left(e^{\sin\sqrt{x}}\right) = \frac{1}{2\sqrt{x}} \cos\sqrt{x} \times e^{\sin\sqrt{x}}}$

Q.6

Solution:

Consider $y = e^{\tan x}$

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}(\tan x)$$

[usnig chain rule]

$$= e^{\tan x} \times \sec^2 x$$

Hence the solution is $\boxed{\frac{d}{dx} = \left(e^{\tan x}\right) = \sec^2 \times e^{\tan x}}$

Q.7

Solution:

Consider $y = \sin^2(2x+1)$

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left[\sin^2(2x+1)\right]$$

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

[using chain rule]

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

[using chain rule]

$$= 4\sin(2x+1)\cos(2x+1)$$

$$= 2\sin 2(2x+1)$$

$\left[\text{Since}, \sin^2 A = 2\sin A\cos A\right]$

$$2\sin(4x+2)$$

Hence the solution is $\boxed{\frac{d}{dx}\left(\sin^2(2x+1)\right) = 2\sin(4x+2)}$

Q.8

Solution:

Consider

$\log_7(2x-3)$

$\Rightarrow y = \dfrac{\log(2x-3)}{\log 7}$

$\left[\text{Since,} \log_a^b = \dfrac{\log b}{\log a}\right]$

Differentiate it with respect to x,

$\dfrac{dy}{dx} = \dfrac{1}{\log 7}\dfrac{d}{dx}(\log(2x-3))$

$= \dfrac{1}{\log 7} \times \dfrac{1}{(2x-3)}\dfrac{d}{dx}(2x-3)$

[usnig chain rule]

$= \dfrac{2}{(2x3)\log 7}$

Hence the solution is $\boxed{\dfrac{d}{dx}(\log_7(2x-3)) = \dfrac{2}{(2x-3)\log 7}}$

Q.9

Solution:

Consider $y = \tan 5x^{\circ}$

$\Rightarrow y = \tan\left(5x^{\circ} \times \dfrac{\pi}{180^{\circ}}\right)$

$= \sec^2 \times \left(5x^{\circ} \times \dfrac{\pi}{180\circ}\right)\dfrac{d}{dx}\left(5x^{\circ}\dfrac{\pi}{180^{\circ}}\right)$

[usnig chain rule]

$= \left(\dfrac{5\pi}{180^{\circ}}\right)\sec^2\left(5x^{\circ}\dfrac{\pi}{180^{\circ}}\right)$

$= \left(\dfrac{5\pi}{180^{\circ}}\right)\sec^2\left(5x^{\circ}\dfrac{\pi}{180^{\circ}}\right)$

$= \dfrac{5\pi}{180^{\circ}}\sec^2(5x^{\circ})$

Hence the solution is, $\boxed{\dfrac{d}{dx}(\tan(5x\circ)) = \dfrac{5\pi}{180^{\circ}}\sec^2(5x^{\circ})}$

Q.10
Solution:

Consider $y = 2^{x^3}$
Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(2^{x^3}\right)$$

$$= 2^{x^3} \times \log_2 \frac{d}{dx}\left(x^3\right)$$

[usnig chain rule]

$$= 3x^2 \times 2^{x^3} \times \log_2$$

Hence the solution is $\boxed{\frac{d}{dx}\left(2^{x^3}\right) = 3x^2 \times 2^{x^3} \log_2}$

Q.11
Solution:

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(3^{e^x}\right)$$

$$= 3^{e^x} \log 3 \frac{d}{dx}\left(e^x\right)$$

[using chain rule]

$$= e^x \times 3^{e^x} \log 3$$

Hence the sollution is $\boxed{\frac{d}{dx}\left(3^{e^x}\right) = e^x \times 3^{e^x} \log 3}$

Q12
Solution:

Consider $y = \log_x 3$

$$\Rightarrow y = \frac{\log 3}{\log x}$$

$$\left[\text{Since}, \log_a^b = \frac{\log b}{\log a}\right]$$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(\frac{\log 3}{\log x}\right)$$

$$=\log 3\frac{d}{dx}(\log x)^{-1}$$

$$=\log 3\times\left[-1(\log x)^{-2}\right]\frac{d}{dx}(\log x)$$

[using chain rule]

$$=-\frac{\log 3}{(\log x)^2}\times\frac{1}{x}$$

$$=-\left(\frac{\log 3}{\log x}\right)^2\times\frac{1}{x}\times\frac{1}{\log 3}$$

$$\left[\text{Since, }\frac{\log b}{\log a}=10a_a^b\right]$$

$$=-\frac{1}{x\log 3(\log_3 x)^2}$$

Hence the solution is, $\boxed{\frac{d}{dx}(\log_x 3)=-\frac{1}{x\log 3(\log_3 x)^2}}$

Q.13

Solution:

Consider $y=3^{x^2+2x}$

Differentiate with respect to x,

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

$$=3^{x^2+2x}\times\log 3\frac{d}{dx}\left(x^2+2x\right)$$

[using chain rule]

$$=(2x+2)\log 3\times 3^{x^2+2x}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(3^{x^2+2x}\right)=(2x+2)\log 3\times 3^{x^2+2x}}$

Q.15

Solution:

Consider $y=3^{x\log x}$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(3^{x\log x}\right)$$

$$=3^{x\log x}\times\log 3\frac{d}{dx}(x\log x)$$

[using chain rule]

$$=3^{x\log x}\times\log 3\left[x\frac{d}{dx}(\log x)+\log x\frac{d}{dx}(x)\right]$$

[using chain rule]

$$=3^{x\log x}\times\log 3\left[\frac{x}{x}+\log x\right]$$

$$=3^{x\log x}(1+\log x)\times\log 3$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(3^{x}\log x\right)=\log 3\times 3^{x\log x}(1+\log x)}$

Q.17

Solution:

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

Q.18

Solution:

Consider $y=(\log\sin x)^2$

Differentiate with respect to x,

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

$$=2(\log\sin x)\times\frac{d}{dx}(\log\sin x)$$

[using chain rule]

$$=2(\log\sin x)\times\frac{1}{\sin x}\frac{d}{dx}(\log x)$$

$$=2(\log\sin x)\times\frac{1}{\sin x}\times\frac{1}{x}$$

$$=\frac{2\log\sin x}{x\sin x}$$

Hence the sollution is, $\boxed{\frac{d}{dx}(\log\sin x)^2=\frac{2\log\sin x}{x\sin x}}$

$$y=\left(\frac{1-x^2}{1+x^2}\right)^{\frac{1}{2}}$$

Differentiate with respect to x,

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

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

[using chain rule]

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

[using quotient rule]

$$=\frac{1}{2}\left(\frac{1+x^2}{1-x^2}\right)^{\frac{1}{2}}\left[\frac{\left(1+x^2\right)(-2x)-\left(1-x^2\right)(2x)}{\left(1+x^2\right)^2}\right]$$

$$=\frac{1}{2}\left(\frac{1+x^2}{1-x^2}\right)^{\frac{1}{2}}\left[\frac{-2x-2x^3-2x+2x^3}{\left(1+x^2\right)2}\right]$$

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

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\sqrt{\frac{1-x^2}{1+x^2}}\right)=\frac{-2x}{\sqrt{1-x^2\left(1+x^2\right)^{\frac{3}{2}}}}}$

Q.21

Solution:

Consider $y=e^{3x}\cos 2x$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(e^{3x}\cos 2x\right)$$

$$=e^{3x}\times\frac{d}{dx}\left(\cos 2x\right)+\cos 2x\frac{d}{dx}\left(e^{3x}\right)$$

[using product rule]

$$=e^{3x}\times\left(-\sin 2x\right)\frac{d}{dx}\left(2x\right)+\cos 2xe^{3x}\frac{d}{dx}\left(3x\right)$$

[using chain rule]

$$=-2e^{3x}\sin 2x+3e^{3x}\cos 2x$$

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

Hence the sollution is, $\boxed{\frac{d}{dx}\left(e^{3x}cps2x\right)=e^{3x}\left(3\cos 2x-2\sin 2x\right)}$

Q.22

Solution:

Consider $y=\sin\left(\log\sin x\right)$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\sin\left(\log\sin x\right)$$

$$=\cos\left(\log\sin x\right)\frac{d}{dx}\left(\log\sin x\right)$$

[using chain rule]

$$=\cos\left(\log\sin x\right)\times\frac{1}{\sin x}\frac{d}{dx}0\ \sin x$$

$$=\cos\left(\log\sin x\right)\frac{\cos x}{\sin x}$$

$$=\cos\left(\log\sin x\right)\times\cot x$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\sin\left(\log\sin x\right)\right)=\cos\left(\log\sin x\right)x\cot x}$

Q.23

Solution:

Consider $y=e^{\tan 3x}$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(e^{\tan 3x}\right)$$

$$=e^{\tan 3x}\frac{d}{dx}(\tan 3x)$$

[using chain rule]

$$=e^{\tan 3x}\times\sec^2 3x\times\frac{d}{dx}(3x)$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(e^{\tan 3x}\right)=3e^{\tan 3x}\times\sec^2 3x}$

Q.24

Solution:

Consider $y=e^{\sqrt{\cot x}}$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(e^{(\cot x)^{\frac{1}{2}}}\right)$$

$$=e^{(\cot x)^{\frac{1}{2}}}\times\frac{d}{dx}(\cot x)^{\frac{1}{2}}$$

[using chain rule]

$$=e^{\sqrt{\cot x}}\times\frac{1}{2}(\cot x)^{\frac{1}{2}-1}\frac{d}{dx}(\cot x)$$

$$=-\frac{e^{\sqrt{\cot x}}\times\cos ec^2 x}{2\sqrt{\cot x}}$$

Hence the sollution is $\boxed{\frac{d}{dx}\left(e^{\sqrt{\cot x}}\right)=-\frac{e^{\sqrt{\cot x}}\times\cos ec^2 x}{2\sqrt{\cot x}}}$

Q.27

Solution:

Consider $y=\tan\left(e^{\sin x}\right)$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left[\tan e^{\sin x}\right]$$

$$=\sec^2\left(e^{\sin x}\right)\frac{d}{dx}\left(e^{\sin x}\right)$$

[using chain rule]

$$=\sec^2\left(e^{\sin x}\right)\times e^{\sin x}\times\frac{d}{dx}(\sin x)$$

$= \cos x \sec^2\left(e^{\sin x}\right) \times e^{\sin x}$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\tan e^{\sin x}\right) = \sec^2\left(e^{\sin x}\right) \times \cos x}$

Q.30

Solution:

Consider $y = \log\left(\cos ecx - \cot x\right)$

Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\log\left(\cos ecx - \cot x\right)$$

$$= \frac{1}{\left(\cos ecx - \cot x\right)} \times \left(-\cos ecx \cot x + \cos ec^2 x\right)$$

[using chain rule]

$$= \frac{1}{\left(\cos ecx - \cot x\right)} \times \left(-\cos ecx \ \cot x + \cos ec^2 x\right)$$

$$= \frac{\cos ecx\left(\cos ecx - \cot x\right)}{\left(\cos ecx - \cot x\right)}$$

$$= \cos ecx$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\log\left(\cos ecx - \cot x\right)\right) = \cos ecx}$

Q.33

Solution:

Consider $y = \tan^{-1}\left(e^x\right)$

Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(\tan^{-1} e^x\right)$$

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

[using chain rule]

$$= \frac{1}{1+e^{2x}} \times e^x$$

$$= \frac{e^x}{1+e^{2x}}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\tan^{-1} e^x\right) = \frac{e^x}{1+e^{2x}}}$

Q.34

Solution:

Consider $y = e^{\sin^{-1} 2x}$

Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(e^{\sin^{-1} 2x}\right)$$

$$= e^{\sin^{-1} 2x} \times \frac{d}{dx}\left(\sin^{-1} 2x\right)$$

[using chain rule]

$$= e^{\sin^{-1} 2x} \times \frac{1}{\sqrt{1-(2x)^2}} \frac{d}{dx}(2x)$$

$$= \frac{2e^{\sin-1} 2x}{\sqrt{1-4x^2}}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(e^{\sin-1} 2x\right) = \frac{2e \sin^{-1} 2x}{\sqrt{1-4x^2}}}$

Q.35

Solution:

Consider $y = \left(2\sin^{-1} x\right)$

Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(\sin\left(2\sin^{-1} x\right)\right)$$

$$= \cos\left(2\sin^{-1} x\right) \frac{d}{dx}\left(2 \sin^{-1} x\right)$$

[using chain rule]

$$= \cos\left(2\sin^{-1} x\right) \times 2 \frac{1}{\sqrt{1-x^2}}$$

$$= \frac{2\cos\left(2\sin^{-1} x\right)}{\sqrt{1-x^2}}$$

Hence the sollution is $\boxed{\frac{d}{dx\left(\sin\left(2\sin^{-1} x\right)\right) = \frac{2\cos\left(2\sin^{-1} x\right)}{\sqrt{1-x^2}}}}$

Q.36

Solution:

Consider $y = e^{\tan^{-1} \sqrt{x}}$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(e^{\tan^{-1}}\sqrt{x}\right)$$

$$=e^{\tan^{-1}\sqrt{x}}\frac{d}{dx}\left(\tan^{-1}\sqrt{x}\right)$$

[using chain rule]

$$=e^{\tan^{-1}\sqrt{x}}\times\frac{1}{1+\left(\sqrt{x}\right)^2}\frac{d}{dx}\left(\sqrt{x}\right)$$

$$=\frac{e^{\tan^{-1}\sqrt{x}}}{1+x}\times\frac{1}{2\sqrt{x}}$$

$$=\frac{e^{\tan^{-1}}\sqrt{x}}{2\sqrt{x}\left(1+x\right)}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(e^{\tan-1}\sqrt{x}\right)=\frac{e^{\tan^{-1}\sqrt{x}}}{2\sqrt{x}\,\left(1+x\right)}}$.

Q.38

Solution:

Consider $y=\log\left(\tan^{-1}x\right)$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\log\left(\tan^{-1}x\right)$$

$$=\frac{1}{\tan^{-1}x}\times\frac{d}{dx}\left(\tan^{-1}x\right)$$

[using chain rule]

$$=\frac{1}{\left(1+x^2\right)\tan^{-1}x}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\log\tan^{-1}x\right)=\frac{1}{\left(1+x^2\right)\tan^{-1}x}}$

Q.43

Solution:

Consider $y=\sin^2\left[\log\left(2x+3\right)\right]$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left[\sin^2\left(\log(2x+3)\right)\right]$$

$$=2\sin\left(\log(2x+3)\right)\frac{d}{dx}\sin\left(\log(2x+3)\right)$$

[using chain rule]

$$=2\sin\left(\log(2x+3)\right)\cos\left(\log(2x+3)\right)\frac{d}{dx}\log(2x+3)$$

$$=\sin\left(2\log(2x+3)\right)\times\frac{1}{(2x+3)}\frac{d}{dx}(2x+3)$$

$[\text{Since}, 2\sin A\cos A=\sin^2 A]$

$$=\sin\left(2\log(2x+3)\right)\times\frac{2}{(2x+3)}$$

Hence the sollution is $\boxed{\frac{d}{dx}\left(\sin^2\log(2x+3)\right)=\sin\left(2\log(2x+3)\right)\times\frac{2}{(2x+3)}}$

Q.44

Solution:

Consider $y=e^x\log\sin 2x$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left[e^x\log\sin 2x\right]$$

$$=e^2\frac{d}{dx}\log\sin 2x+\log\sin 2x\frac{d}{dx}\left(e^x\right)$$

[using product rule and chain rule]

$$=e^x\frac{1}{\sin 2x}\frac{d}{dx}(\sin 2x)+\log\sin 2x\left(e^x\right)$$

$$=\frac{e^x}{\sin 2x}\cos 2x\frac{d}{dx}(2x)+e^z\log\sin 2x$$

$$=\frac{2\cos 2xe^x}{\sin 2x}+e^x\log\sin 2x$$

$$=e^x\left(2\cot 2x+\log\sin 2x\right)$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(e^x\log\sin 2x\right)=e^x\left(2\cot 2x+\log\sin 2x\right)}$

Q.47

Solution:

Consider $y=\left(\sin^{-1}x^4\right)^4$

Differentiate with respect to x,

$$\frac{dy}{dx}=\frac{d}{dx}\left(\sin^{-1}x^4\right)^4$$

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

[using chain rule]

$$=4\left(\sin^{-1}x^4\right)^3\frac{1}{\sqrt{1-\left(x^4\right)^2}}\frac{d}{dx}\left(x^4\right)$$

$$=4\left(\sin^{-1}x^4\right)^3\frac{4x^3}{\sqrt{1-x^8}}$$

$$=\frac{16x^3\left(\sin^{-1}x^4\right)^3}{\sqrt{1-x^8}}$$

Hence the sollution is, $\boxed{\frac{d}{dx}\left(\sin^{-1}x^4\right)=\frac{16x^3\left(\sin^{-1}x^4\right)^3}{\sqrt{1-x^8}}}$

Q.50

Solution:

Consider $y=3e^{-3x}\log(1+x)$

Differentiating it with respect to x and applying the chain and the product rule, we get

$$\frac{dy}{dx}=3\frac{d}{dx}\left[e^{-3x}\log(1+x)\right]$$

$$\frac{dy}{dx}=3\left(e^{-3x}\frac{1}{1+x}+\log(1+x)\left(-3e^{-3x}\right)\right)$$

$$=3\left(\frac{e^{-3x}}{1+x}-3\log(1+x)\right)$$

The sollution is,

$$\boxed{=3e^{-3c}\left(\frac{1}{1+x}-3\log(1+x)\right)}$$

Q.56

Solution:

Consider $y=\cos(\log x)^2$

Differentiating it with respect to x and applying the chain and the product rule, we get

$$\frac{dy}{dx}=\frac{d}{dx}\cos\left(\log x\right)^2$$

$$=-\sin\left(\log x\right)^2\frac{d}{dx}\left(\log x\right)^2$$

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

$$\frac{dy}{dx}=\frac{-2\log x\sin\left(\log x\right)^2}{x}$$

So The sollution is $\boxed{\frac{dy}{dx}=\frac{-2\log x\sin\left(\log x\right)^2}{x}}$

Q.59

Solution:

Consider $y=\cos\left(\log x\right)^2$

Differentiating it with respect to x and applying the chain and the product rule, we get

$$\frac{dy}{dx}=\frac{d}{dx}\sqrt{x+1}+\frac{d}{dx}\sqrt{x-1}$$

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

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

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

$$\frac{dy}{dx}=\frac{1}{2}\left(\frac{y}{\sqrt{x^2-1}}\right)$$

$$\boxed{So,\sqrt{x^2}-\frac{dy}{dx}=\frac{1}{2}y}$$

Q.63

Solution:

$$y=\sqrt{x}+\frac{1}{\sqrt{x}}$$

Differentiate with respect to x,

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

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

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

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

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

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

Hence the sollution is, $\boxed{2x\frac{dy}{dx} = \sqrt{x} - \frac{1}{\sqrt{x}}}$

Q.71

Solution:

Differentiate with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(e^{x} + e^{-x}\right)$$

$$= \frac{d}{dx}e^{x} + \frac{d}{dx}e^{-x}$$

$$= e^{x} + e^{-x}\frac{d}{dx}(-x)$$

[using chian rule]

$$= e^{x} + e^{-x}(-1)$$

$$= \left(e^{x} - e^{-x}\right)$$

$$= \sqrt{\left(e^{x} + e^{-x}\right)^{2} - 4e^{x} \times e^{-x}}$$

$$\left[\text{Since,} (a-b) = \sqrt{(a+b)^{2} - 4ab}\right]$$

$$= \sqrt{y^{2} - 4}$$

$$\left[\text{Since } e^{x} + e^{-x} = y\right]$$

Hence the sollution is, $\boxed{\frac{dy}{dx} = \sqrt{y^2 - 4s}}$

Q.72

Solution:

Differentiating with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(\sqrt{a^2 - x^2}\right)$$

$$= \frac{1}{2\sqrt{a^2 - x^2}} \frac{d}{dx}\left(a^2 - x^2\right)$$

[using chain rule]

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

$$= \frac{-x}{\sqrt{a^2 - x^2}}$$

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

$$\left[\text{Since,} \sqrt{a^2 - x^2} = y\right]$$

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

Hence the sollution is, $\boxed{y\frac{dy}{dx} + x = 0}$