= (Exercise # 3.5) = Q(1-34)

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Find dy/dx?

Rules

$\frac{d}{dx}\cos x = -\sin x$

$\frac{d}{dx}\sin x = \cos x$

$\frac{d}{dx}\csc x = -\csc x \cot x$

$\frac{d}{dx}\sec x = \sec x \tan x$

$\frac{d}{dx}\tan x = \sec^2 x$

$\frac{d}{dx}\cot x = -\csc^2 x$

① $y = -10x + 3\cos x$

Sol.

$y = -10x + 3\cos x$

$y' = -10\frac{d}{dx}x + 3\frac{d}{dx}\cos x$

$\boxed{y' = -10 - 3\sin x}$

② $y = \frac{3}{x} + 5\sin x$

Sol.

$y = \frac{3}{x} + 5\sin x$

$y' = 3\frac{d}{dx}x^{-1} + 5\frac{d}{dx}\sin x$

$\boxed{y' = -3x^{-2} + 5\cos x}$

③ $y = x^2\cos x$

Sol.

$y = x^2\cos x$

$y' = \frac{d}{dx}x^2\frac{d}{dx}\cos x$

$y' = x^2\frac{d}{dx}\cos x + \cos x\frac{d}{dx}x^2$

$\boxed{y' = -x^2\sin x + 2x\cos x}$

④ $y = \sqrt{x}\sec x + 3$

Sol.

$y = \sqrt{x}\sec x + 3$

$y' = \sqrt{x}\frac{d}{dx}\sec x + \sec x\frac{d}{dx}x^{1/2} + \frac{d}{dx}(3)$

$y' = \sqrt{x}\sec x\tan x + \frac{\sec x}{2\sqrt{x}} + 0$

$\boxed{y' = \sqrt{x}\sec x\tan x + \frac{\sec x}{2\sqrt{x}}}$

⑤ $y = \csc x - 4\sqrt{x} + 7$

$y' = \frac{d}{dx}\csc x - 4\frac{d}{dx}x^{1/2} + \frac{d}{dx}(7)$

$y' = -\csc^2 x\cot x - \frac{4}{2\sqrt{x}} + 0$

$\boxed{y' = -\csc^2 x\cot x - \frac{2}{\sqrt{x}}}$

⑥ $y = x^2\cot x - \frac{1}{x^2}$

Sol.

$y' = x^2\frac{d}{dx}\cot x + \cot x\frac{d}{dx}x^2 - \frac{d}{dx}x^{-2}$

$y' = -x^2\csc^2 x + 2x\cot x + 2x^{-3}$

$\boxed{y' = -x^2\csc^2 x + 2x\cot x + 2/x^3}$

⑦ $f(x) = \sin x\tan x$

$f'(x) = \sin x\frac{d}{dx}\tan x + \tan x\frac{d}{dx}\sin x$

$f'(x) = \sin x\sec^2 x + \tan x\cos x$

$f'(x) = \sin x\sec^2 x + \left(\frac{\sin x}{\cos x}\right)\cos x$

$\boxed{f'(x) = \sin x\left(\sec^2 x + 1\right)}$

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⑧ $g(x) = \csc x \cot x$

Sol:

$g'(x) = \csc x \frac{d}{dx}\cot x + \cot x \frac{d}{dx}\csc x$

$g'(x) = -\csc^3 x + (-\csc x \cot^2 x)$

$g'(x) = -\csc x(\csc^2 x + \cot^2 x)$

$\boxed{g'(x) = -\csc x(\csc^2 x + \cot^2 x)}$

⑨ $y = (\sec x + \tan x)(\sec x - \tan x)$

Sol:

$y' = (\sec x + \tan x)\frac{d}{dx}(\sec x - \tan x) + (\sec x + \tan x)\frac{d}{dx}(\sec x + \tan x)$

$y' = (\sec x + \tan x)(\sec x \tan x - \sec^2 x) + (\sec x - \tan x)(\sec x \tan x + \sec^2 x)$

$y' = \sec^2 x \tan x - \sec^3 x + \sec x \tan^2 x - \sec x \tan x + \sec^2 x \tan x + \sec^3 x - \sec x \tan^2 x - \sec x \tan x$

$\boxed{y' = 0}$

⑩ $y = (\sin x + \cos x)\sec x$

$y' = (\sin x + \cos x)\frac{d}{dx}\sec x + \sec x \frac{d}{dx}(\sin x + \cos x)$

$y' = (\sin x + \cos x)(\sec x \tan x) + \sec x(\cos x - \sin x)$

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

$y' = \frac{\sin^2 x + \cos x \sin x + \cos^2 x - \cos x \sin x}{\cos^2 x}$

$y' = \frac{1}{\cos^2 x} \Rightarrow \boxed{y' = \sec^2 x}$

⑪ $y = \frac{\cot x}{1 + \cot x}$

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

$y' = \frac{(1+\cot x)(-\csc^2 x) - \cot x(-\csc^2 x)}{(1+\cot x)^2}$

$y' = \frac{-\csc^2 x \cot x - \csc^2 x + \csc^2 x \cot x}{(1+\cot x)^2}$

$\boxed{y' = \frac{-\csc^2 x}{(1+\cot x)^2}}$

⑫ $y = \frac{\cos x}{1 + \sin x}$

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

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

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

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

$\boxed{y' = -1/1+\sin x}$

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(13) $y = \frac{4}{\cos x} + \frac{1}{\tan x}$

$y = 4\left(\frac{1}{\cos x}\right) + \frac{1}{\tan x}$

$y = 4\sec x + \cot x$

$y' = 4\frac{d}{dx}\sec x + \frac{d}{dx}\cot x$

$\boxed{y' = 4\sec x \tan x - \csc^2 x}$

(14) $y = \frac{\cos x}{x} + \frac{x}{\cos x}$

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

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

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

(15)

$y = x^2\sin x + 2x\cos x - 2\sin x$

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

$y' = x^2\cos x + 2x\sin x + 2(-x\sin x + \cos x) - 2\cos x$

$y' = x^2\cos x + 2x\sin x - 2x\sin x + 2\cos x - 2\cos x$

$\boxed{y' = x^2\cos x}$

(16)

$y = x^2\cos x - 2x\sin x - 2\cos x$

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

$y' = -x^2\sin x + 2x\cos x + 2x\cos x - 2\sin x + 2\sin x$

$\boxed{y' = -x^2\sin x}$

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(17) $f(x) = x^3 \sin x \cos x$

Sol,

$f(x) = x^3 \sin x \cos x$

$f'(x) = x^3 \sin x \frac{d}{dx}(\cos x) + x^3 \frac{d}{dx}\sin x (\cos x) + \frac{d}{dx} x^3 \sin x \cos x$.

$f'(x) = -x^3 \sin^2 x + x^3 \cos^2 x + 3x^2 \sin x \cos x$

$$\boxed{f'(x) = -x^3 \sin^2 x + x^3 \cos^2 x + 3x^2 \sin x \cos x}$$

(18) $g(x) = (2-x)\tan^2 x$.

$g'(x) = (2-x)\frac{d}{dx}\tan^2 x + \tan^2 x \frac{d}{dx}(2-x)$

$g'(x) = (2-x)(2\tan x \sec^2 x) + (\tan^2 x)(-1)$

$g'(x) = 2(2-x)\tan x \sec^2 x - \tan^2 x$

$$\boxed{g'(x) = 2(2-x)\tan x(\sec^2 x - \tan x)}$$

(19) $s = \tan t - t$

$s = \tan t - t$

$s' = \frac{d}{dt}\tan t - \frac{d}{dt} t$

$$\boxed{s' = \sec^2 t - 1}$$

(20) $s = t^2 - \sec t + 1$

$s' = \frac{d}{dt} t^2 - \frac{d}{dt}\sec t + \frac{d}{dt}(1)$

$$\boxed{s' = 2t - \sec t \tan t}$$

(21) $s = \frac{1 + \csc t}{1 - \csc t}$

$s' = \frac{(1-\csc t)(-\csc t \cot t) - (1+\csc t)(\csc t \cot t)}{(1-\csc t)^2}$

$s' = \frac{-\csc t \cot t + \csc^2 t \cot t - \csc t \cot t - \csc^2 t \cot t}{(1-\csc t)^2} \Rightarrow \boxed{s' = \frac{-2\csc t \cot t}{(1-\csc t)^2}}$

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(22) $s = \frac{\sin t}{1-\cos t}$

Quotient Rule.

$s' = \frac{1}{\cot t - 1}$

(23) $r = 4 - \theta^2 \sin\theta$.

Power Rule + Product Rule.

$r' = -\theta(\theta\cos\theta + 2\sin\theta)$

(24) $\gamma = \theta\sin\theta + \cos\theta$.

Power Rule + Product Rule.

$r' = \theta\cos\theta$

(25) $r = \sec\theta\csc\theta$.

Product Rule

$r' = \sec^2\theta - \csc^2\theta$

(26) $r = (1+\sec\theta)\sin\theta$.

Product Rule.

$r' = \cos\theta + \sec^2\theta$.

(27) $p = 5 + \frac{1}{\cot q}$.

Power Rule.

$p' = \sec^2 q$.

(28) $p = ((1+\csc q)\cos q)$

Power + Product Rule.

$p' = -\sin q - \csc^2 q$.

(29) $p = \frac{\sin q + \cos q}{\cos q}$.

Quotient Rule.

$p' = \sec^2 q$.

(30) $p = \frac{\tan q}{1+\tan q}$

Quotient Rule.

$p' = \frac{\sec^2 q}{(1+\tan q)^2}$

(31) $p = \frac{q\sin q}{q^2 - 1}$

Quotient + Product Rule.

$p' = \frac{q^3\cos q - q^2\sin q - q\cos q - \sin q}{(q^2-1)^2}$

(32) $p = \frac{3q + \tan q}{q\sec q}$

Quotient + Power Rule.

$p' = \frac{q\sec^3 q - 3q^2\sec q\tan q - q\sec q\tan^2 q - \sec q\tan q}{(q\sec q)^2}$

(33) Find y'' if

a) $y = \csc x$

$y'' = 2\csc^3 x - \csc x$.

b) $y = \sec x$

$y'' = 2\sec^3 x - \sec x$.

(34) Find $y^{(4)}$:

a) $y = -2\sin x$.

$y' = -2\cos x$

$y'' = -2(-\sin x)$

$y''' = 2\cos x$

$y'''' = -2\sin x$

b) $y = q\cos x$.

$y' = -q\sin x$

$y'' = -q\cos x$

$y''' = q\sin x$

$y'''' = q\cos x$.

(THE END)