$$
\text { Ex: } \begin{aligned}
y & =\sin \left(x^{2}\right) \\
y^{\prime} & =\cos \left(x^{2}\right) \cdot 2 x \\
y^{\prime} & =2 x \cos \left(x^{2}\right)
\end{aligned}
$$

(1) $n$ )

$$
\begin{aligned}
& y=\sin (\tan x) \\
& y^{\prime}=\tan (\tan x) \cdot \sec ^{2} x \\
& y^{\prime}=\sec ^{2} x[\cos (\tan x)]
\end{aligned}
$$

K)

$$
\begin{aligned}
& y=\frac{1}{\sqrt{(\sec 2 x-1)^{3}}}=\frac{1}{(\sec 2 x-1)^{3 / 2}}=(\sec 2 x-1)^{-3 / 2} \\
& y^{\prime}=\frac{-3}{2}(\sec 2 x-1)^{-5 / 2} \cdot \sec 2 x \tan 2 x \cdot(2) \\
& y^{\prime}=\frac{-3 \sec (2 x) \tan (2 x)}{(\sec 2 x-1)^{5 / 2}} \\
& y^{\prime}=\frac{-3 \sec (2 x) \tan (2 x)}{\sqrt{(\sec 2 x-1)^{5}}}
\end{aligned}
$$

(1)

$$
\begin{aligned}
& \text { 0) } y=\tan ^{2}(\cos x)=[\tan (\cos x)]^{2} \\
& y^{\prime}=2[\tan (\cos x)] \cdot \sec ^{2}(\cos x) \cdot(-\sin x)(1) \\
& y^{\prime}=-2 \sin x[\tan (\cos x)]\left[\sec ^{2}(\cos x)\right]
\end{aligned}
$$

b $y=\frac{x^{2} \tan x}{\underline{\sec x}}=x^{2}\left(\frac{\sin x}{\cos x}\right) \cdot\left(\frac{\cos x}{1}\right)=x^{2} \sin x$

$$
\begin{aligned}
& y^{\prime}=x^{2}(\cos x)(1)+2 x(\sin x) \\
& y^{\prime}=x^{2} \cos x+2 x \sin x \\
& y^{\prime}=x[x \cos x+2 \sin x]
\end{aligned}
$$

Final Review

$$
\begin{aligned}
& \text { (1) b) } f(x)=\frac{\frac{2 x-2}{x+3}}{f(x+h)}=\frac{2 x+2 h-2}{x+h+3} \\
& f^{\prime}(x)=\lim _{h \rightarrow 0} \frac{(x+3)(x+h+3)\left(\frac{2 x+2 h-2)}{x+h+3}-\frac{(2 x-2)}{x+3}\right.}{h(x+3)(x+h+3)}(x+3)(x+h+3) \\
& =\lim _{h \rightarrow 0} \frac{2 x^{2}+2 x h-2 x+6 x+6 h-6-\left(2 x^{2}+2+2+h+6 x-2 x-2 h-6\right)}{h(x+3)(x+h+3)} \\
& =\lim _{h \rightarrow 0} \frac{8 k}{k(x+3)(x+h+3)}=\frac{8}{(x+3)^{2}}
\end{aligned}
$$

h)

$$
\begin{aligned}
& y=\left(x^{2}(\operatorname{sc}(x)\right. \\
& y^{\prime}=\left(x^{2}\right)(-\csc x \cot x)(1)+2 x \csc x \\
& y^{\prime}=-x^{2} \csc x \cot x+2 x \csc x \\
& y^{\prime}=x \csc x(-x \cot x+2) \\
& y^{\prime}=x \csc (2-x \cot x)
\end{aligned}
$$

i)

$$
\begin{aligned}
& y^{\prime}=x \csc (2-x \cot x) \\
& y=\cot ^{3}(1-\partial x)^{2}=\left[\cot (1-2 x)^{2}\right]^{3} \\
& y^{\prime}=3\left[\left(1-\partial x^{2}=\partial(1-2 x)(-2)\right.\right. \\
& \left.y^{\prime}=3 \cot ^{2}(1-2 x)^{2}\right]^{2}\left[-\operatorname{scc}^{2}\left(1-2 x x^{2}\right)\right]\left[2(1-2 x)\left(-2 \csc ^{2}(1-2 x)^{2}\right][-4(1-2 x)]\right. \\
& y^{\prime}=12(1-2 x) \cot ^{2}(1-2 x)^{2} \csc ^{2}(1-2 x)^{2}
\end{aligned}
$$

k)

$$
\begin{aligned}
& y=\frac{1}{\sqrt{(\sec 2 x-1)^{3}}}=\frac{1}{(\sec 2 x-1)^{3 / 2}}=(\sec \partial x-1)^{-3 / 2} \\
& y^{\prime}=\frac{-3}{\partial}(\sec 2 x-1)^{-5 / 2}(\sec 2 x \tan 2 x)(x) \\
& y^{\prime}=\frac{-3 \sec \partial x \tan 2 x}{(\sec 2 x-1)^{5 / 2}}=\frac{-3 \sec 2 x \tan 2 x}{\sqrt{(\sec \partial x-1)^{5}}}
\end{aligned}
$$

b $y=\frac{x^{2}[\sqrt{\tan x}}{[\sec x]}=x^{2} \cdot \frac{\sin x}{\cos x} \cdot \frac{\cos x}{1}=x^{2} \sin x$

$$
\begin{aligned}
& y^{\prime}=x^{2}(\cos x)(1)+2 x \sin x \\
& y^{\prime}=x^{2} \cos x+2 x \sin x \\
& y^{\prime}=x[x \cos x+2 \sin x]
\end{aligned}
$$

0) 

$$
\left.\begin{array}{ll} 
& u=\cos x \\
y & =\tan ^{2}(\cos x)=[\tan (\cos x)]^{2} \quad d u=-\sin x
\end{array}\right]
$$

(6) Find the points on the curve $y=\frac{x}{x-1}$ where the tangent line is parallel to the line $x+4 y=1$
(1) $x+4 y=1$

$$
4 y=-x+1
$$

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

$m=-\frac{1}{4}$
(3)

$$
\begin{array}{ll}
\frac{-1}{(x-1)^{2}}=-\frac{1}{4} & \text { (4) } y=\frac{x}{x-1} \\
-(x-1)^{2}=-4 & y=\frac{3}{3-1} \\
(x-1)^{2}=4 & y=\frac{3}{2} \\
x^{2}-2 x+1=4 & \\
x^{2}-2 x-3=0 & (3,3 / 2) \\
(x-3)(x+1)=0 & \\
x-3=0 & x+1=0 \\
x=3 & x=-1
\end{array}
$$

(2)

$$
\begin{aligned}
& y=\frac{x}{x-1} \\
& y^{\prime}=\frac{(x-1)(1)-x}{(x-1)^{2}} \\
& y^{\prime}=\frac{-1}{(x-1)^{2}}
\end{aligned}
$$

| $y=\frac{3}{3-1}$ | $y=\frac{-1}{-1-1}$ |
| :--- | :--- |
| $y=\frac{3}{2}$ | $y=\frac{1}{2}$ |
| $(3,3 / 2)$ | $(-1,1 / 2)$ |

(6) Find the point on the curve $y=x \sqrt{x}$ where the tangent line is parallel to the line $6 x-y=4$
(1) $6 x-y=4$
(2)

$$
y=x \sqrt{x}=x(x)^{1 / 2}=x^{3 / 2}
$$

$$
6 x-4=y
$$

$$
y=6 x-4
$$

$$
m=6
$$

(3)

$$
\begin{aligned}
\frac{3 \sqrt{x}}{2} & =\frac{6}{1} \\
3 \sqrt{x} & =12 \\
\sqrt{x} & =4 \\
x & =16
\end{aligned}
$$

(4)

$$
\begin{aligned}
& y=x \sqrt{x} \\
& y=(16) \sqrt{16} \\
& y=64 \\
& (16,64)
\end{aligned}
$$

