U) Suppose $u$ and $v$ are differentiable functions at $x = 2$ and $u(2) = 3$, $u'(2) = 3$, $v(2) = 1$, $v'(2) = 2$

i) Find $\frac{d}{dx}(uv)$

ii) Find $\frac{d}{dx}\left(\frac{u}{v}\right)$

\[
\begin{align*}
\frac{dy}{dx} &= \frac{dx}{dx} \\
y' &= 1
\end{align*}
\]

iii) Find $\frac{d}{dx}(3u - 2v + 2uv)$

\[
\begin{align*}
\frac{d}{dx}(3u - 2v + 2uv) &= 3 \frac{du}{dx} - 2 \frac{dv}{dx} + 2u \frac{dv}{dx} + v \left(2 \frac{du}{dx}\right) \\
&= 3u' - 2v' + 2uv' + 2vv'
\end{align*}
\]

V) Find the derivative of $y = x$ with respect to $x$

\[
\frac{dy}{dx} = \frac{dx}{dx} = 1
\]

W) Find the derivative of $y = x$ with respect to $t$

\[
\frac{dy}{dt} = \frac{dx}{dt}
\]

X) Find the derivative of $y = x$ with respect to $P$
What you’ll Learn About

- How to find the derivative of a trig function

\[ \cot^2 \theta = (\cot \theta)^2 \]

A) \( y = 5 + x^2 - \tan x \)

\[ y = 5 + x^2 - \tan x \]

\[ \frac{dy}{dx} = 2x - 5 \sec^2 x \]

B) \( y = x \sin x \)

\[ y = (x)(\sin x) \]

\[ \frac{dy}{dx} = x \cos x + \sin x(1) \]

C) \( y = \frac{4}{\cot \theta} \)

\[ y = \frac{4}{\cot \theta} \]

\[ \frac{dy}{d\theta} = -4(-\csc^2 \theta) \]

\[ \frac{dy}{d\theta} = 4 \csc^2 \theta \]

\[ \frac{dy}{d\theta} = \frac{4 \csc^2 \theta}{\cot^2 \theta} \]

D) \( y = \frac{\sin \theta - \cos \theta}{\sec \theta + \csc \theta} \)

\[ y = \frac{\sin \theta - \cos \theta}{\sec \theta + \csc \theta} \]

\[ \frac{dy}{d\theta} = \frac{(\sec \theta + \csc \theta)(\cos \theta + \sin \theta) - (\sin \theta - \cos \theta)(\sec \theta \tan \theta - \csc^2 \theta)}{(\sec \theta + \csc \theta)^2} \]