Lesson 6 – The Derivative of $y = tanx$

PART A: Recall

From a previous investigation, we determined that the derivative of $\cos(x)$ was $-\sin x$ and that the derivative of $\sin(x)$ was $\cos x$.

Using this information, we can determine the derivative of $\tan(x)$ WITHOUT doing an investigation.

PART B: Deriving the derivative of $\tan(x)$

Step 1: Rewrite $\tan(x)$ using your knowledge of identities:

tanx = sinx/cosx

Step 2: Now, take the derivative of this identity to determine the derivative of $\tan(x)$

$$= \frac{cosxcosx - sinx(-sinx)}{cos^2x}$$

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

$$= \frac{1}{cos^2x}$$

$$= sec^2x$$

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PART C: Summary

The derivative of $tan(x)$:

If $f(x) = \tan(x)$, then $f'(x)$ $= sec^2x$

In Leibniz notation, $\frac{d}{dx}[\tan(x)]$ $= sec^2x$

$\frac{d}{dx}[\tan(g(x))]$ $= sec^2g(x) \cdot g'(x)$

Example: Determine the derivative of each the following:

a) $y = \tan(x^3 - 5x)$

$=sec^2(x^3 - 5x)(3x^2-5)$

b) $y = xtan(5x + 3)$

$=(1)tan(5x+3)+xsec^2(5x+3)(5)$

$=tan(5x+3)+5xsec^2(5x+3)$

c) $y = (cosx + tanx)^5$

$=5(cosx + tanx)^4(-sinx+sec^2x)$

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