4.1 Day 2

Monday, September 16, 2019 9:06 AM

Ex: Let $f(1)=4$, $f'(1)=-2$, $g(1)=6$, $g'(1)=-1$,

$f(6)=1$, $f'(6)=4$, $g(6)=9$, $g'(6)=2$

a. Find the derivative of $f(g(x))$ @ $x=1$.

$f'(g(1))\cdot g'(1) \Rightarrow f'(6)(-1) \Rightarrow 4(-1)=-4$

b. Find the derivative of $f(\sqrt{x})$ @ $x=1$

$f(x^{1/2}) \Rightarrow f'(x^{1/2})\cdot \frac{1}{2}x^{-1/2}$

$f'(1^{1/2})\cdot \frac{1}{2}(1)^{-1/2}$

$-2\cdot\frac{1}{2}=-1$

Ex: Differentiate $y=\sqrt{x^5+4x}$

$y=(x^5+4x)^{1/2}$

$y'=\frac{1}{2}(x^5+4x)^{-1/2}(5x^4+4)$

Ex: Diff. $y=\frac{1}{(x^3-4x+7)^3}$

$y=(x^3-4x+7)^{-3}$

$y'=-3(x^3-4x+7)^{-4}(3x^2-4)$

$y=\tan x$ find y''

$y'=\sec^2 x=(\sec x)^2$

$y''=2(\sec x)\cdot \sec x\tan x$

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

Find derivative Parametrically

Find derivative Parametrically

Given $y(t)$ and $x(t)$, how would we find $\frac{dy}{dx}$??

Ex: $x = 2\sin t$

$y = 2\cos t$

Find the tangent line to the curve @ $(\sqrt{3}, 1)$ p.o.t where $t = \frac{\pi}{3}$.

$x = \sin t$ $\quad \frac{dx}{dt} = \cos t \cdot \frac{dt}{dt} = \cos t$

$y = \cos t$ $\quad \frac{dy}{dt} = -\sin t \cdot \frac{dt}{dt} = -\sin t$

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{dy}{dx} \text{ ✓}$$

$$= \frac{-\sin t}{\cos t} = -\tan t$$

$$\frac{dy}{dt} = \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = -\sqrt{3} = m$$

$$y - 1 = -\sqrt{3}(x - \sqrt{3})$$

Try: $x = \sec t$ $\quad y = \tan t$ $\quad$ Find dy/dx @ $t = \pi$

$\frac{dx}{dt} = \sec t \tan t$ $\quad \frac{dy}{dt} = \sec^2 t$

$$\frac{dy}{dx} = \frac{\sec^2 t}{\sec t \tan t}$$

$$= \frac{\sec t}{\tan t}$$

$$= \frac{\sec \pi}{\tan \pi} = \frac{-1}{0} \text{ und}$$

Can you write the equation of the tangent line?

$x = \sec \pi$ $\quad x = -1$

tangent line?

$x = \sec \pi$ $\boxed{x = -1}$