Week 8 Tuesday

October 23, 2018 10:03 AM

Quiz tomorrow 24.8

$f(x) \approx f(a) + f'(a)(x-a)$ will be given

$f(x)$	$f'(x)$
$\sec x$	$\sec x \tan x$
$\tan x$	$\sec^2 x$
$\cos x$	$-\sin x$
$\sin x$	$\cos x$
$\csc x$	$-\csc x \cot x$
$\cot x$	$-\csc^2 x$
$\arcsin x$	$\frac{1}{\sqrt{1-x^2}}$
$\arccos x$	$\frac{-1}{\sqrt{1-x^2}}$
$\arctan x$	$\frac{1}{1+x^2}$

27.6 Derivatives of Exponential Functions

$f(x)$	$f'(x)$
$\ln x$	$\frac{1}{x}$
$\log_2 x$	$\frac{1}{\ln 2} \cdot \frac{1}{x}$
e^x	e^x
7^x	$\ln 7 \cdot 7^x$

Ex: Find $f'(x)$

a) $f(x) = 9e^{2x}(e^{3x} + e^{4x})$

expand

$f(x) = 9(e^{5x} + e^{6x})$

$f'(x) = 9(5e^{5x} + 6e^{6x})$

Aside $f(x) = 4^{3x+1}$

$f'(x) = \ln 4 \cdot 4^{3x+1} \cdot 3$

b) $f(x) = \dfrac{e^{3x} + e^{4x}}{e^{5x}}$ simplify

$f(x) = e^{-5x}(e^{3x} + e^{4x})$

$f(x) = e^{-2x} + e^{-x}$

$f'(x) = -2e^{-2x} - e^{-x}$

c) $f(x) = (4e^{7x})^2 e^{6x}$ simplify

$f(x) = 16e^{14x} \cdot e^{6x}$

$f(x) = 16e^{20x}$

$f'(x) = 16 \cdot 20e^{20x}$

$= 320e^{20x}$

27.8 Applications of Ch 27

Newton's Method
Linear Approx.
Max/Min.
(Ch. 24)

+

Trig
Inverse Trig
Logs
Exponents

Ex: Approximate a solution to $x = \cos x$

Newton's Method (24.2)

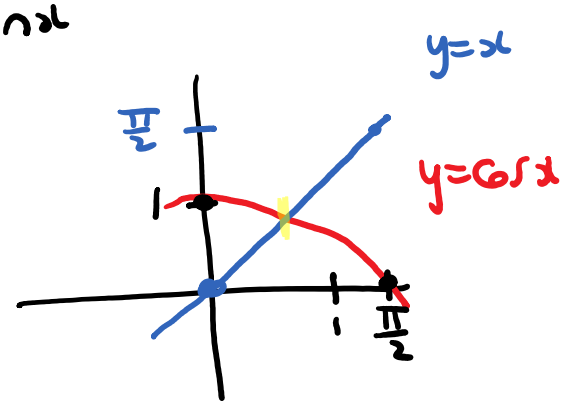
$x - \cos x = 0$

$\underbrace{\quad}_{f(x)}$

$f(x) = x - \cos x$

$f'(x) = 1 + \sin x$

Choose x_0



Choose $x_0 = 1$

x_n	$f(x_n)$	$f'(x_n)$	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$	
1	0.4597	1.8415	0.7504	(0.75)
0.7504	0.0190	1.6819	0.7391	(0.74)
0.7391	0.0000	*	0.7391	(0.74)

Radian Mode

$x \simeq 0.74$

Ex: An object has position $x = \log_2(3t+4)$ $y = 3^{\sin t}$

Find the velocity at 1 second

(Position : m Time : s)

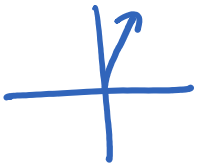
$v_x = \frac{1}{\ln 2} \cdot \frac{1}{3t+4} \cdot 3$ $v_y = \ln 3 \cdot 3^{\sin t} \cdot \cos t$

Radian Mode

@ $t=1$ $v_x \approx 0.6183$ $v_y \simeq 1.4961$

speed $v = \sqrt{v_x^2 + v_y^2} \approx 1.6$ m/s

Direction $\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right)$ $(+180°?)$



$$\theta = \tan^{-1}\left(\frac{1.4961}{0.6183}\right)$$

$$\approx 68°$$

1.6 m/s at 68°