Good afternoon; warm-up in NOTES (not journal; need to have this)

ASSESSMENT DELAYED TO FRIDAY

Find the derivative of tan(θ)

$\frac{d}{d\theta}(\tan\theta)$

$\frac{d}{dx}\frac{f(x)}{g(x)} = \frac{f'g - fg'}{g^2}$

$\frac{d}{d\theta}\left(\frac{\sin\theta}{\cos\theta}\right) = \frac{\cos\theta\cdot\cos\theta - (\sin\theta\cdot -\sin\theta)}{\cos^2(\theta)}$

$\frac{\cos^2\theta + \sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2(\theta)} = \left(\frac{1}{\cos\theta}\right)^2$

$= \sec^2\theta$

Add to booklet:

$\frac{d}{dx}\sin(x) = \cos(x)$

$\frac{d}{dx}\cos(x) = -\sin(x)$

$\frac{d}{dx}\tan(x) = \sec^2(x)$

$\frac{d}{dx}\cot(x) = -\csc^2(x)$

$\frac{d}{dx}\sec(x) = \sec(x)\cdot\tan(x)$

$\frac{d}{dx}\csc(x) = -\csc(x)\cdot\cot(x)$

Homework solutions

1 $-7x^6 - 15x^4 - 2x$

2 $96x^5 - 32x^3 + 10x$

3 $-\dfrac{24x^3}{9x^8 + 30x^4 + 25}$ $(3x^4+5)^2$

4 $\dfrac{15x^8 - 25x^6 + 30x^4 + 30x^2}{25x^8 + 20x^4 + 4}$ $(5x^4+2)^2$

5. f(x) = g(x)h(x)
take the derivative $f'(10) = ?$

f'(x) = g'(x)h(x) + g(x)h'(x)
f'(10)=g'(10)h(10)+g(10)h'(10)
= 0 * 560 + -4 *35
= 0 - 140
= -140

Using tables to find derivatives

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	−2	4	−2
2	1	0	2	$-\frac{3}{2}$
3	3	$\frac{3}{2}$	1	0
4	4	1	2	1

Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(2)$

[redacted]

$h'(x) = f'(x) + g'(x)$

$h'(2) = f'(2) + g'(2)$

$0 + -\frac{3}{2} = -3/2$

Using tables to find deriv

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	−2	4	−2
2	1	0	2	$-\frac{3}{2}$
3	3	$\frac{3}{2}$	1	0
4	4	1	2	1

[redacted]

Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(2)$

[redacted]

$h'(x) = f'(x) - g'(x) = \frac{3}{2}$

Using tables to find deriv

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	-2	4	-2
2	1	0	2	$-\frac{3}{2}$
3	3	$\frac{3}{2}$	1	0
4	4	1	2	1

[redacted]

Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(2)$

[redacted]

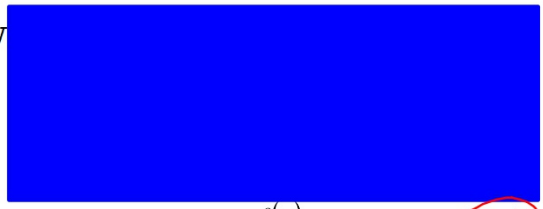
$h'(x) = f'g + fg'$

$f'(2)\,g(2) + f(2)\,g'(2)$

$0 \cdot 2 + 1 \cdot -\frac{3}{2} = -3/2$

Using tables to find deriv

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	−2	4	−2
2	1	0	2	$-\frac{3}{2}$
3	3	$\frac{3}{2}$	1	0
4	4	1	2	1



Part 4) Given $h_4(x) = \frac{f(x)}{g(x)}$, find $h_4'(3)$

3/2

The Chain Rule

$\frac{d}{dx}[\square]^n = n[\square]^{n-1}$

Find the derivative of $y = (2x+3)^{10}$

$\frac{dy}{dx} = 10(2x+3)^9 \cdot 2$

$\boxed{\frac{dy}{dx} = 20(2x+3)^9}$

In general....

GENERALIZED POWER RULE

$$\frac{d}{dx}\left(f(x)\right)^n = n\left(f(x)\right)^{n-1} \cdot f'(x)$$

CHAIN RULE

If $y = f(g(x))$

then

$$\frac{dy}{dx} = f'(g(x)) \cdot g'(x)$$

$$(2x+3)^{10}$$

find derivative of $\sin(3x)$

$$y' = \cos(3x) \cdot 3$$

$$y' = 3\cos(3x)$$

find derivative of $\cos^2(4x)$

$$y = (\cos(4x))^2$$

$$y' = 2(\cos(4x))^1 \cdot -\sin(4x) \cdot 4 = \boxed{-8\cos(4x)\sin(4x)}$$

Finding the VALUE of a derivative on a calculator (ie, the slope of the function)

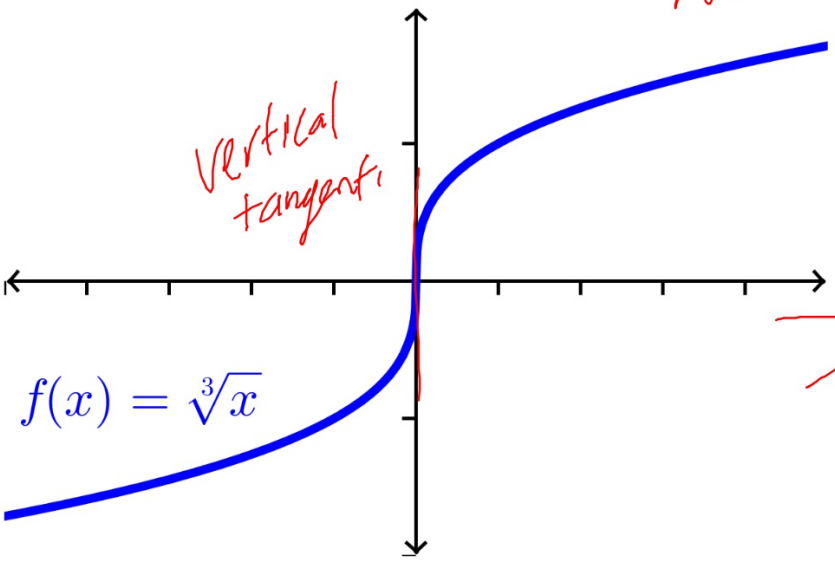
1. Type function you want to find the derivative of into Y1 in the Y= screen

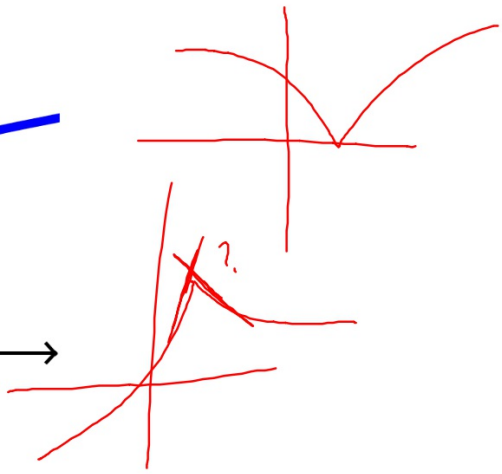
2. Graph it

3. Click 2ND then TRACE (Calc menu) and select option 6 (dy/dx)

4. Enter the x-value you want to find evaluate the derivative at.

Is this function differentiable everywhere? No





Differentiability-Continuity relationship

$f(x) = x^{1/3} = \sqrt[3]{x}$ (domain of f? f continuous everywhere?)

$\frac{1}{3} x^{-2/3}$

$f'(x) = \frac{1}{3x^{2/3}}$ (domain of f'? f' continuous everywhere?)

$\frac{1}{3\sqrt[3]{x^2}}$

A function f(x) is differentiable where its derivative f'(x) is continuous.

Homework:
p. 125: #16-18, #43-46 , 70, 73, 74
p. 136: #8, 9, 24, 49, 56
(D-CD1-6)