Test #1
Monday Sept 28
R.1-6
1.1-1.6
Practice Test
- RH 1558
6:00-7:00
- Proctor
- Testing Center
Fill out the survey

1.7 The Chain Rule

Review:

Power Rule: $y = x^n$

$y' = n \cdot x^{n-1}$

Ex $y = x^{10}$ $y' = 10x^9$

Product Rule: $y = u \cdot v$

$y' = u'v + uv'$

Quotient Rule: $y = \frac{u}{v}$,

$y' = \frac{u'v - uv'}{v^2}$

.....

Extended Power Rule

If $y = [g(x)]^n$

Then $y' = n[g(x)]^{n-1} \cdot g'(x)$

Ex $y = (x^2 + 3x - 1)^7$

$y' = 7(x^2 + 3x - 1)^6 \cdot (2x + 3)$

same der

Ex $f(x) = 3(5x^2 + 2)^{-3}$

$f'(x) = -9(5x^2 + 2)^{-4} \cdot 10x$

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$-90x(5x^2+2)^{-4}$

Ex $f(x) = x^3 + (8x + 11)^3$

$f'(x) = 3x^2 + 3(8x+11)^2 \cdot 8$

Ex $f(x) = \sqrt{4x^2 + 3x + 5} = (4x^2 + 3x + 5)^{1/2}$

$f'(x) = \frac{1}{2}(4x^2 + 3x + 5)^{-1/2} \cdot (8x + 3)$

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

Ex $y = (3x^2+7x-1)^8$

$y' = 8(3x^2+7x-1)^7 \cdot (6x+7)$

Ex $f(x) = \underbrace{(2x+3)^4}_{u} \cdot \underbrace{(5x+6)^7}_{v}$

use Product Rule

$u = (2x+3)^4$ $\quad v = (5x+6)^7$

$u' = 4(2x+3)^3 \cdot 2$ $\quad v' = 7(5x+6)^6 \cdot 5$

$= 8(2x+3)^3$ $\quad = 35(5x+6)^6$

$y' = u'v + uv'$

$= 8(2x+3)^3 \cdot (5x+6)^7 + (2x+3)^4 \cdot 35(5x+6)^6$

Online HW

$= (2x+3)^3 (5x+6)^6 \left(8(5x+6) + 35(2x+3)\right)$

$= \ldots$

1.8 Higher-Order Derivatives

$f(x)$ is a function with derivative $f'(x)$.
But $f'(x)$ is also a function, it should have a derivative!

Der of $y = f(x)$	is	called
$f'(x)$	$f''(x)$	1st der
$f''(x)$	$f'''(x)$	2nd der
$f'''(x)$	$f^{(4)}(x)$	3rd der
		4th
	$\vdots$	
	$f^{(n)}(x)$	n^{th} der

With alternate notation

$$f'(x) = \frac{dy}{dx}, \quad f''(x) = \frac{d}{dx}\frac{dy}{dx} = \frac{d^2y}{dx^2}, \quad f'''(x) = \frac{d^3y}{dx^3}$$

Ex $f(x) = x^4 + x^3 + x^2 + x + 1$ Find $f'''(x)$

$f'(x) = 4x^3 + 3x^2 + 2x + 1$

$f''(x) = 12x^2 + 6x + 2$

$f'''(x) = 24x + 6$

Ex $f(x) = x^{9/7}$ Find $f''(x)$

$f'(x) = \frac{9}{7} x^{2/7}$

$$f''(x) = \frac{9}{7} \cdot \frac{2}{7} \cdot x^{-5/7} = \frac{18}{49} x^{-5/7}$$

Ex $y = \underbrace{\frac{3x+2}{5x-1}}_{u \quad v}$ find y''

use Quotient Rule

$u = 3x+2$ $\qquad$ $v = 5x-1$

$u' = 3$ $\qquad$ $v' = 5$

$$y' = \frac{u'v - uv'}{v^2} = \frac{3(5x-1) - (3x+2)5}{(5x-1)^2}$$

$$= \frac{15x - 3 - 15x - 10}{(5x-1)^2}$$

$$= \frac{-13}{(5x-1)^2}$$

For y'' use Q-R. again OR $y' = -13(5x-1)^{-2}$

$$y'' = 26(5x-1)^{-3} \cdot 5$$

$$\overset{OR}{=} 130(5x-1)^{-3}$$

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