Final Exam Review I

Date: Monday December 14

Test time #1: (Brag ID)
Time: 8am - 10am — talk to instructor before test.
Room: ??? (with another instructor)

Test time #2:
Time: 5pm - 9:30 pm (2 hr block)
Room: KHI 558

Testing Center (FH 1080) if these times don't work.

Pick up past tests, UH 3014 (RF 3-4, F 12-1)

Bring a calculator that does e^x and $\ln x$.

Make sure to turn in assignments that are missing.
Online HW due Monday Dec 14 11:59pm

Formulas on the final: Consumer/Producer Surplus
Accumulated Future/Present Value

This Friday Extra (Optional) Class: 12-1, 3-4, 6-7

Next week office hours: M 2:30-4:30pm in UH 3014

Lowest test grade is replaced by final exam if the final is higher.

Chapter 1

Limit = what happens to a function **near** a value not **at** a value

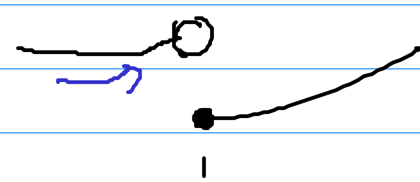
Left Limit $\lim_{x \to 2^-}$ Right Limit $\lim_{x \to 2^+}$

Limits can be found by table

x	$f(x)$
1.9	.
1.99	.
1.999	.

↑ 2 from left

or visually



Two-sided limit $\lim_{x \to 2}$

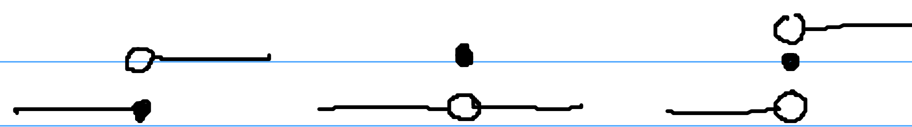
exists if $\lim_{x \to 2^-} = \lim_{x \to 2^+}$

DNE if $\neq$

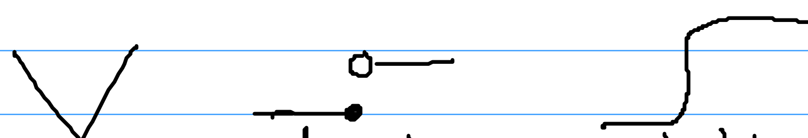
Continuous if $\lim_{x \to 2} f(x) = \text{value at } 2 = f(2)$

near 2 = at 2

Discontinuous



Not Differentiable



sharp corner discontinuous vertical tangent

If $f(x)$ is continuous (ex all polynomials)

$$\lim_{x \to 2} f(x) = f(2)$$

Ex $\lim_{x \to 2} x^2+3x-1 = (2)^2+3(2)-1$

If f(2) has $\frac{0}{0}$ form, factor or make a table

Ex $\lim_{x \to 2} \frac{x^2-4}{x^2-3x+2} = \lim_{x \to 2} \frac{\cancel{(x-2)}(x+2)}{\cancel{(x-2)}(x-1)} = \frac{4}{1}$

Testing continuity → test left, right limits and at the point

$$f(x) = \begin{cases} x+1 & x<2 \\ 5-x & x \geq 2 \end{cases}$$

left limit $\lim_{x \to 2^-} x+1 = 3$

right limit $\lim_{x \to 2^+} 5-x = 3$

at the point $f(2) = 3$

all equal so continuous at $x=2$

Derivative Limit Definition given on final

$$f'(x) = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$$

- use limit definition, not shortcut

Ex $f(x) = x^2+3x$

Method

- Find f(x+h), plug x+h into f(x)

$f(x+h) = (x+h)^2+3(x+h)$

- Next $f(x+h)-f(x)$

$(x+h)^2+3(x+h)-[x^2+3x]$

$= \cancel{x^2}+2xh+h^2+\cancel{3x}+3h-\cancel{x^2}-\cancel{3x}$

$= 2xh+h^2 \quad +3h$

– Next $\div h$

$$\frac{2xh+h^2+3h}{h} = \frac{2xh}{h} + \frac{h^2}{h} + \frac{3h}{h}$$
$$= 2x + h + 3$$

– Last $\lim_{h \to 0}$

$$\lim_{h\to 0} 2x + h + 3$$
$$= 2x + 0 + 3$$
$$= 2x + 3$$

Know Derivatives (Recall $f^{(4)}$ = 4^{th} derivative)

$$\frac{d}{dx} x^n = n x^{n-1}$$

Convert to x^{power} first

$\frac{1}{x^3} \rightarrow x^{-3}$

$\sqrt{x} \rightarrow x^{1/2}$

$\sqrt[m]{x^n} \rightarrow x^{n/m}$

#7e $f(x) = \sqrt[3]{x^2} = x^{2/3}$

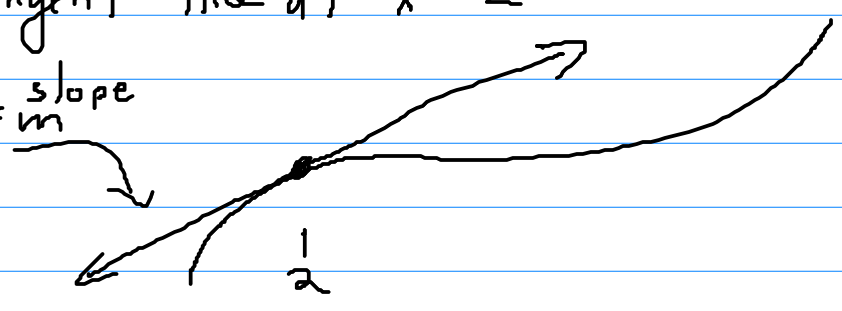
$f'(x) = \frac{2}{3} x^{-1/3}$

$\frac{d}{dx} e^x = e^x$ $\qquad$ $\frac{d}{dx} \ln x = \frac{1}{x}$

$\frac{d}{dx} 7^x = \ln 7 \cdot 7^x$ $\qquad$ $\frac{d}{dx} \log_5 x = \frac{1}{\ln 5} \cdot \frac{1}{x}$

The derivative $f'(2)$ is the slope of the tangent line at $x=2$

$f'(2) = \overset{\text{slope}}{m}$



#8 Find the equation of the tangent line to $f(x) = x^3 - 2x^2 + 5x$ at the point $(\underset{x}{2}, \underset{y}{10})$.

slope

$$f'(x) = 3x^2 - 4x + 5$$

$$m = f'(2) = 12 - 8 + 5 = 9$$

line

$$y - y_1 = m(x - x_1) \quad \text{OR} \quad y = mx + b$$

$$y - 10 = 9(x - 2) \qquad 10 = 9 \cdot 2 + b$$

$$y - 10 = 9x - 18 \qquad b = -8$$

$$y = 9x - 8 \qquad y = 9x - 8$$