LIMITS AND CONTINUITY

Note Title 2/13/2018

CONSIDER $f(x) = 2x + 3$

x	y
3	9
3.5	10
3.9	10.8
3.99	10.98
3.999	10.998

x	y
5	13
4.5	12
4.1	11.2
4.01	11.02
4.001	11.002

- AS x APPROACHES 4 IN LIST 1, y APPROACHES 11
- AS x APPROACHES 4 IN LIST 2 y APPROACHES 11
- THE LIMIT AS x APPROACHES 4, y $f(x)$

APPROACHES 11

$$\lim_{x \to 4} f(x) = 11$$

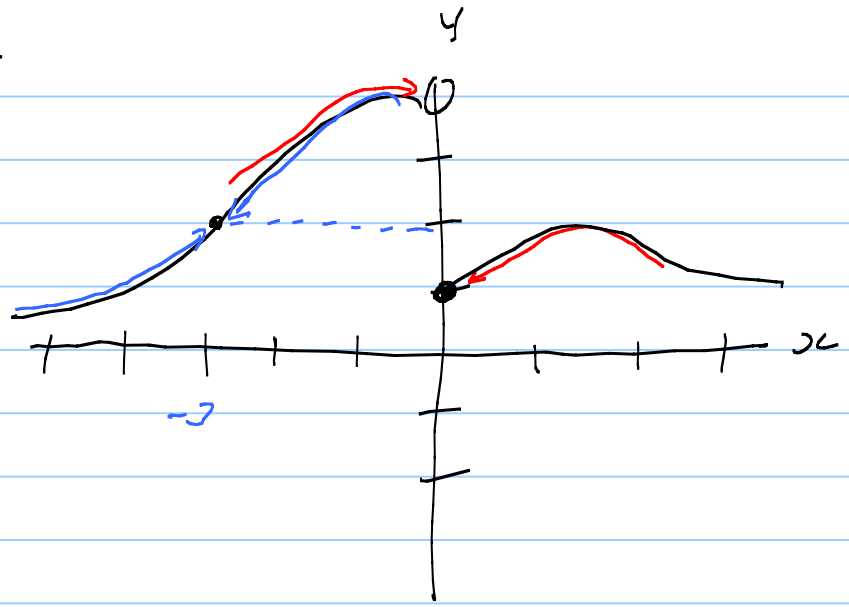
DEFN. A FUNCTION f HAS A LIMIT L AS x APPROACHES a $\lim_{x \to a} f(x) = L$

IF ALL VALUES OF $f(x)$ ARE CLOSE TO L FOR VALUES OF x THAT ARE ARBITRARILY CLOSE, BUT NOT EQUAL TO a.

IE IF $y = 4x + 5$ $\lim_{x \to 5} = 4(5) + 5$

$= 25$

IE



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

(+ MEANS FROM THE RIGHT)

$\lim_{x \to -3^-} f(x) = 2$

(− MEANS FROM THE LEFT)

$\lim_{x \to -3} f(x) = 2$

$\lim_{x \to 0^+} f(x) = 1$

$\lim_{x \to 0^-} f(x) = 4$

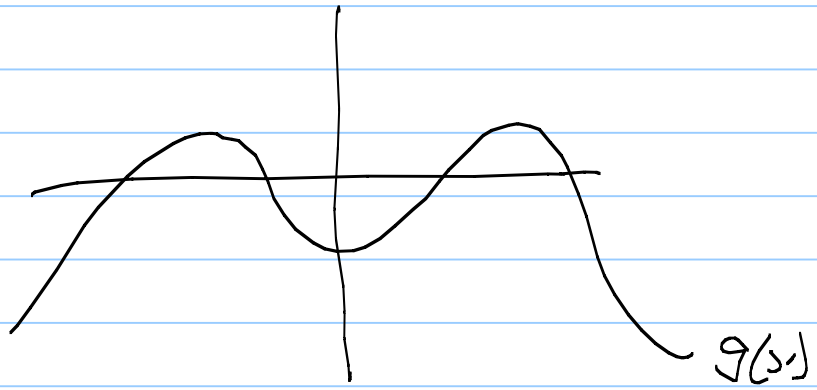
$\lim_{x \to 0} f(x) =$ D.N.E (DOES NOT EXIST)

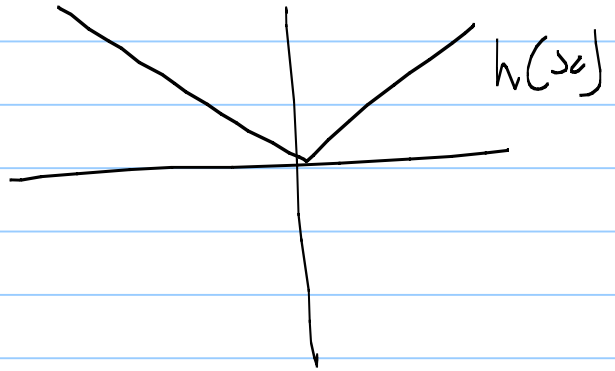
CONTINUITY

- WHEN THE LIMIT OF A FUNCTION IS THE SAME AS THE FUNCTION VALUE, THE FUNCTION IS CONTINUOUS. $\lim_{x \to a} f(x) = f(a)$

IT IS SAID TO BE CONTINUOUS AT A POINT (a)

IE

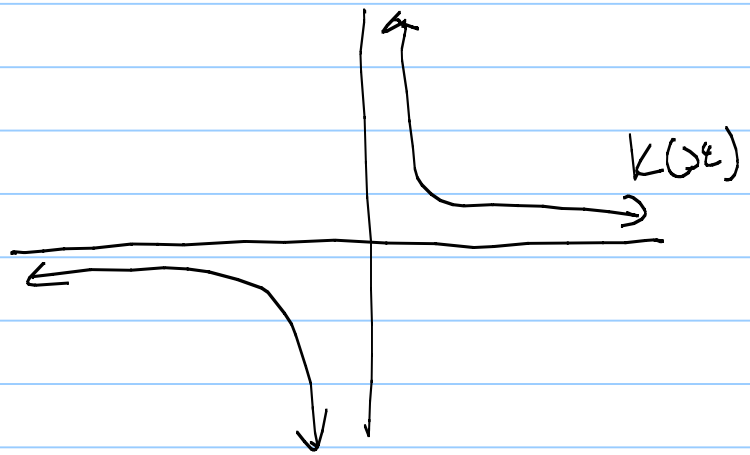


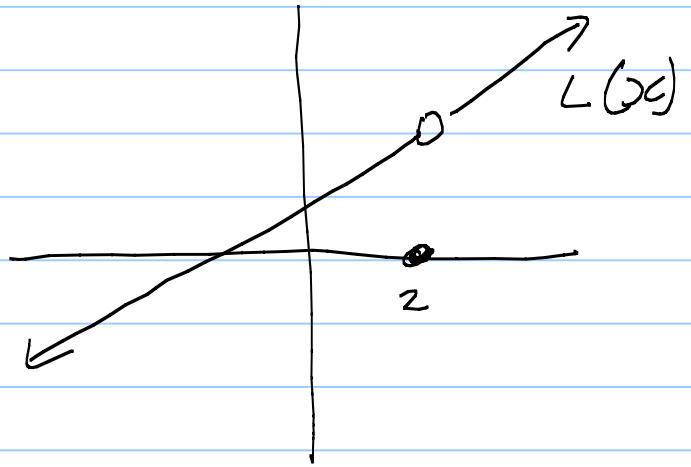


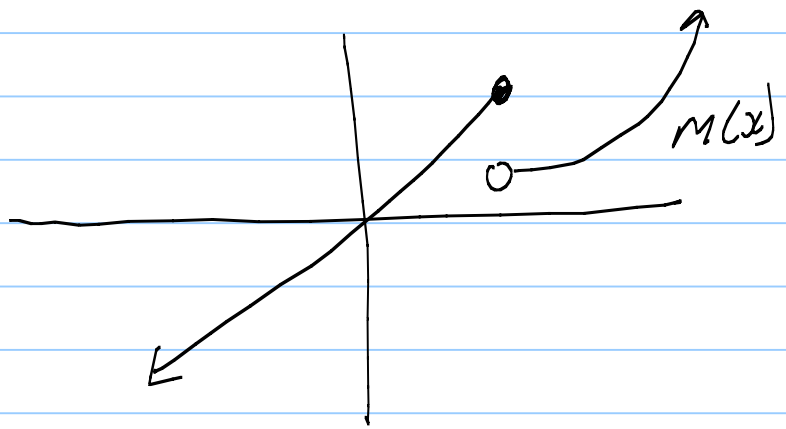
$g(x)$ AND $h(x)$ ARE SAID TO BE CONTINUOUS

OVER THE SAME INTERVAL

IE







$K(x)$: CONTINUOUS

$(-\infty, 0)$ AND $(0, \infty)$

$L(x)$: CONTINUOUS

$(-\infty, 2)$ AND $(2, \infty)$

$M(x)$: CONTINUOUS

$(-\infty, 2]$ AND $(2, \infty)$

DEFINITION OF CONTINUITY

f IS CONTINUOUS AT $x = a$ IF

1) $f(a)$ EXISTS

2) $\lim_{x \to a} f(x)$ EXISTS

3) $\lim_{x \to a} f(x) = f(a)$

EG DETERMINE IF $f(x) = x^2 + 3x + 4$ IS CONTINUOUS

AT $x = 4$

1.) $f(4) = 4^2 + 3(4) + 4 = 32$ } EXISTS

2.) $\lim_{x \to 4} x^2 + 3x + 4 = 32$ ✓ EXISTS ✓ SAME

3.) $\lim_{x \to 4} f(x) = f(4)$

∴ $f(x)$ IS CONTINUOUS AT $x = 4$

H/W Pg 91 # 1-9, 19-26