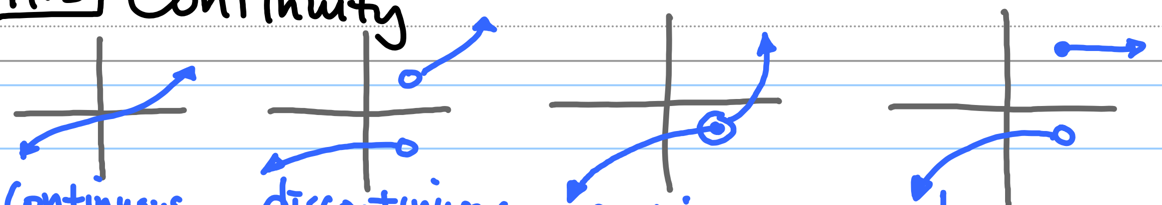
5/23 THU

11.3 Continuity



continuous | discontinuous | continuous | discontinuous

ex 1) Determine if f is continuous at "a"

function ... value

a) $f(x) = 8x^4 - 4x^3 + x - 2$; $a = 0$

$f(0) = 8(0)^4 - 4(0)^3 + (0) - 2 = -2$ ← answer exists

$\therefore$ continuous (at that point)

b) $f(x) = \dfrac{x-3}{x+6}$; $a = -6$

also vertical asymptote

$f(-6) = \dfrac{-6-3}{-6+6} = \dfrac{-9}{0}$ (!!)

→ discontinuous @ -6

c) $f(x) = \begin{cases} -3x-2 & \text{if } x<1 \\ 1 & \text{if } x=1 \\ 7x-3 & \text{if } x>1 \end{cases}$; $a = 1$

$f(1) = \begin{cases} -3(1)-2 = -5 \\ 1 = 1 \\ 7(1)-3 = 4 \end{cases}$ values are different

$\therefore$ → discontinuous @ 1

ex 2) Determine for which numbers, if any, the given function is discontinuous.

a) $f(x) = 5x - 2$ ← line : $\boxed{\text{continuous}}$

b) $f(x) = x^2 - 5$ ← parabola : $\boxed{\text{continuous}}$

c) $f(x) = \dfrac{3x-2}{x^2-4}$ → vertical asymp : $x^2 - 4 = 0$

$(x-2)(x+2) = 0$

$x = 2, -2$

$\therefore$ $\boxed{\text{discontinuous @ } -2, 2}$

d) $f(x) = \begin{cases} x-2 & \text{if } x \le 2 \\ x^2-4 & \text{if } x>2 \end{cases}$

Test $f(2)$

• where the domain changes ---

$f(2) = \begin{cases} 2-2 = 0 \\ 2^2 - 4 = 0 \end{cases}$ continuous @ 2!

e) $f(x) = \begin{cases} x^2+1 & \text{if } x<2 \\ 5 & 2 \le x < 5 \\ x+1 & x \ge 5 \end{cases}$ Test $a=2$ & 5

$f(2) = \left\{\begin{array}{l} 2^2+1 = 5 \\ 5 \quad\;\; = 5 \end{array}\right\}$ continuous @ 2

$f(5) = \left\{\begin{array}{l} 5 \quad\;\; = 5 \\ 5+1 = 6 \end{array}\right\}$ $\boxed{\text{discontinuous @ 5}}$