Math 1431, Section 17699

EMCF 2 (10 points)

Due 2/6 at 11:59pm

Sol

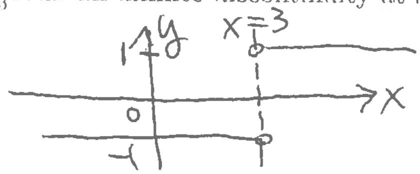
Instructions:

- Submit this assignment at http://www.casa.uh.edu under "EMCF" and choose EMCF 2.

B 1. $f(x) = \frac{|x-3|}{x-3}$ has an infinite discontinuity at $x = 3$.

a. True

b. False

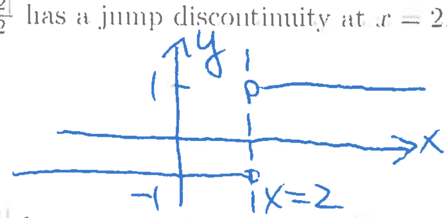


Jump Discontinuity

A 2. $f(x) = \frac{|x-2|}{x-2}$ has a jump discontinuity at $x = 2$.

a. True

b. False

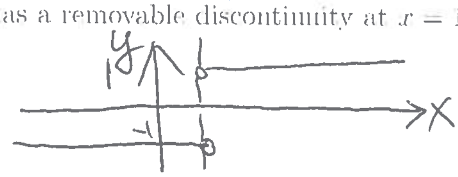


Jump Discontinuity

B 3. $f(x) = \frac{|x-1|}{x-1}$ has a removable discontinuity at $x = 1$.

a. True

b. False



Jump Discontinuity

A 4. The function $f(x) = \begin{cases} x^3, & x \le 2 \\ x^2 + 4, & x > 2 \end{cases}$ is continuous everywhere.

a. True

b. False

check ① $\lim_{x \to 2^+} f(x)$. ② $\lim_{x \to 2^-} f(x)$ and ③ $f(x)$

$2^2 + 4 = 8$ $\quad$ $2^3 = 8$ $\quad$ $2^3 = 8$

f is conti. at $x = 2$ since ①=②=③

E 5. Find the x-coordinates for all points of discontinuity for $f(x) = \begin{cases} x^3 + 6, & x \le -1 \\ -5, & x > -1 \end{cases}$.

a. 1

b. $-\sqrt[3]{6}$

c. $-1, -5$

d. None exists

e. -1

f. -5

Polynomials are always continuous

$\Rightarrow f(x)$ is conti. on $(-\infty, -1) \cup (-1, \infty)$

check $x = -1$

① $\lim_{x \to -1^+} f(x)$ ② $\lim_{x \to -1^-} f(x)$ and ③ $f(-1)$

$(-1)^3 + 6 = 5$ $\quad$ -5 $\quad$ $(-1)^3 + 6 = 5$

①=③≠②

$\boxed{\text{Discontinuity @ } x = -1.}$

A 6. If f and g are continuous at c, $\frac{f}{g}$ may be discontinuous at c.

a. True

b. False

If $g(c)=0$, $\frac{f(x)}{g(x)}$ may not exist at $x=c$.

A 7. $f(x) = x^7 - 3x^4 + 13$ has no points of discontinuity.

a. True

b. False

$f(x)$ is a Polynomial.

A 8. Give the value(s) of x where the function $f(x) = \frac{(x+2)(x+3)}{x^2-9}$ has an infinite discontinuity.

a. 3

b. -3

c. $3, -3$

d. $-2, -3$

e. $-2, 3$

f. None of the above.

Check the x such that the denominator equals zero

$\Rightarrow x^2-9=0 \Rightarrow (x+3)(x-3)=0 \Rightarrow x=3$ or $x=-3$.

Check @ $x=-3$: $f(x)$ is "$\frac{0}{0}$" which means removable disconti. @ $x=-3$

check @ $x=3$: $\lim_{x\to3} f(x) = \lim_{x\to3} \frac{(x+2)(x+3)}{(x-3)(x+3)} = \lim_{x\to3} \frac{x+2}{x-3}$ DNE

E 9. Give a value of A so that the function $f(x) = \begin{cases} x - x^2, & x < 2 \\ x^2 + Ax, & x \geq 2 \end{cases}$ is continuous.

a. 0

b. -1

c. -2

d. There is no such value

e. -3

f. None of the above.

Check @ $x=2$.

① $\lim_{x\to2^+} f(x) = 4+2A$, ② $\lim_{x\to2^-} f(x) = 2-4=-2$ and ③ $f(2) = 2A+4$, then let ①=②=③

$\Rightarrow 2A+4=-2$

$2A=-6$

$A=-3$

B 10. The Intermediate Value Theorem can be used to show that there is a solution to $f(x) = \frac{3x^3-2x-1}{x} = 0$ on $[-2, 4]$.

a. True

b. False

$N=0$

Now $a=-2$, $b=4$, check if $f(a)f(b) \leq 0$

(i.e. $f(a) \leq 0 \leq f(b)$ or $f(b) \leq 0 \leq f(a)$).

$f(4) = \frac{3\cdot4^3-2\cdot4-1}{4} = \frac{183}{4} > 0$ $\Rightarrow$ IVT fails.

$f(-2) = \frac{-24+4-1}{-2} = \frac{-21}{-2} = \frac{21}{2} > 0$