

Quiz Continuity and Limits 2018
Introduction to Calculus

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Name

Answers

Indicate the type and locations of any discontinuities in the functions below.

$$1) f(x) = \frac{x^2 + x - 12}{x + 3} \quad \frac{(x+3)(x-4)}{(x+3)}$$

Asymp (inf) at $x = -3$
Remov at $x = -3$
(pt) ✓

$$2) f(x) = \frac{x^2 - 11x + 30}{x - 5} \quad \frac{(x-5)(x-6)}{(x-5)}$$

Remov at $x = 5$
(pt) ✓

$$3) f(x) = \frac{x^3 + 2x^2 - x - 2}{x^2 + x - 2} \quad \frac{(x+2)(x-1)(x+1)}{(x+2)(x-1)}$$

Remov at $x = -2, x = 1$
(pt) ✓ ✓

$$4) f(x) = \frac{x^3}{3} + \frac{x^2}{2} - x$$

Continuous ✓

$$5) f(x) = \begin{cases} x^2 - 5 & (x < 3) \\ 3x - 7 & (x \geq 3) \end{cases} \quad \begin{matrix} (3, 4) \\ (3, 2) \end{matrix}$$

Jump at $x = 3$

$$6) f(x) = \begin{cases} \frac{2x+4}{x^2} & (x \leq 2) \\ x^2 & (x > 2) \end{cases} \quad \begin{matrix} (2, 2) \\ (2, 4) \end{matrix}$$

✓ Jump at $x = 2$ ✓

✓ Remov at $x = -2$ ✓

overall of quiz:
-1/2 for factoring error

7) Fill in the domains for the piecewise function so that the function is continuous.

$$f(x) = \begin{cases} x^2 - 9x + 4 & x < \underline{2} \\ -5x & x \geq \underline{2} \end{cases} \quad \checkmark$$

$$x^2 - 9x + 4 = -5x$$

$$x^2 - 4x + 4 = 0$$

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

$$x = 2$$

if with error
in checking
jump, $(-\frac{1}{2})$

if no attempt
to check
jump, (-2)

For questions 8-9 fill in the blank with the choice which describes the function at the point indicated.

A → the function has an Asymptotic (or infinite) discontinuity
R → the function has a Removable (or point) discontinuity
J → the function has a Jump discontinuity
C → the function is Continuous

$$\begin{array}{l} -1 = -\frac{1}{2} \\ -2 = -1.5 \\ -3 = -2 \\ -4 = -3 \end{array} \quad \begin{array}{l} -5 = -3.5 \\ -6 = -4.5 \\ -7 = -5 \\ -8 = -6 \end{array}$$

$$8) f(x) = \begin{cases} \frac{x^2 - 1}{x^2 - 3x + 2} & (x \leq -1) \\ \frac{-x - 1}{2} & (x > -1) \end{cases}$$

$$9) f(x) = \begin{cases} \frac{-x - 1}{2} & (x \leq 0) \\ \frac{x^2 - 1}{x^2 - 3x + 2} & (x > 0) \end{cases}$$

$$f(x) = \begin{cases} \frac{(x-1)(x+1)}{(x-2)(x-1)} & (-1, 0) \\ -\frac{x-1}{2} & (-1, 0) \end{cases}$$

at $x = -1$ C at $x = 0$ C ✓

at $x = -1$ C at $x = 0$ C ✓ ✓

at $x = 1$ C at $x = 2$ C ✓ ✓

at $x = 1$ R at $x = 2$ A ✓

10) What value of c makes $f(x)$ a continuous function?

$$f(x) = \begin{cases} \frac{3x^2 + 5x - 2}{x + 2} & (x \neq -2) \\ c & (x = -2) \end{cases}$$

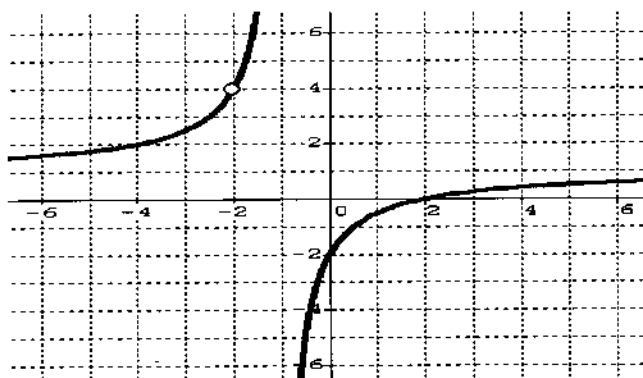
$$\frac{(3x-1)(x+2)}{x+2} \quad \checkmark$$

$$3(-2) - 1 = -7$$

$$c = -7 \quad \checkmark$$

11) The graph of $f(x)$ is shown below. Complete the equation of function $f(x)$ shown in factored form.

$$f(x) = \frac{(x-2)(x+2)}{(x+2)(x+1)}$$



OK if no "DNE"

$(-\frac{1}{2})$ for DNE w/ wrong reason

12) Find the following limits. If the limit Does Not Exist state D.N.E. and why ($+\infty, -\infty, \text{left} \neq \text{right}$).

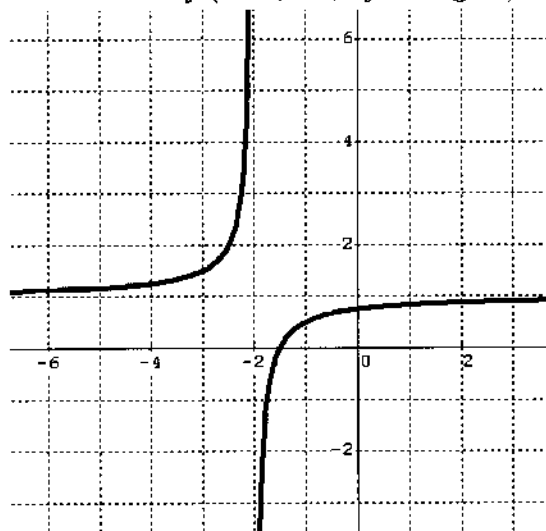
a) $\lim_{x \rightarrow -2^-} f(x) = \text{DNE}(\infty) \checkmark$

b) $\lim_{x \rightarrow -2^+} f(x) = \text{DNE}(-\infty) \checkmark$

c) $\lim_{x \rightarrow \infty} f(x) = 1 \checkmark$

d) $\lim_{x \rightarrow -\infty} f(x) = 1 \checkmark$

OK if
"0"



e) $\lim_{x \rightarrow 2^-} f(x) = +1 \checkmark$

f) $\lim_{x \rightarrow 2^+} f(x) = -1 \checkmark$

g) $\lim_{x \rightarrow 2} f(x) = \text{DNE}(\text{left} \neq \text{right}) \checkmark$

h) $\lim_{x \rightarrow \infty} f(x) = \text{DNE}(\infty) \checkmark$

i) $\lim_{x \rightarrow -\infty} f(x) = \text{DNE}(\infty) \checkmark$

j) $\lim_{x \rightarrow 4} f(x) = 1 \checkmark$



Find the following limit. Circle the correct answer AND show work whenever possible.

13) $\lim_{x \rightarrow \infty} \frac{x^4 - 2x^2 - x}{3x^4 + 2x}$

(a) 1

(b) $\frac{1}{3}$

(c) 3

(d) DNE (∞)

(2)

$\frac{1}{3}$

$\frac{1}{3}$

Find the following limits. Circle the correct answer **AND** show work whenever possible.

14) $\lim_{x \rightarrow -\infty} \frac{-2x + 3x^3}{4x^2 - 1}$

(a) 0

(b) $\frac{3}{4}$

(c) DNE (∞)

(d) DNE ($-\infty$)

can count work

for partial credit

15) $\lim_{x \rightarrow 2} \frac{x^2 - 3x + 2}{x^2 - x - 2}$

$\frac{(x-2)(x-1)}{(x-2)(x+1)} = \frac{1}{3}$

(a) 1

(b) $\frac{1}{3}$

(c) 3

(d) -1

$-\frac{1}{2}$ for factoring error

16) $\lim_{x \rightarrow -5^+} \frac{x^2 + 7x}{x + 5}$

$\frac{-4.9(-4.9+7)}{-4.9+5} = \frac{x(x+7)}{x+5}$

17) $\lim_{x \rightarrow 3^-} \frac{x^2 + 9}{x^2 - 6x + 9}$

$\frac{2.9^2 + 9}{(2.9-3)^2}$

(a) 1

(b) 6

(c) DNE (∞)

(d) DNE ($-\infty$)

-1 for wrong DNE

(a) 1

(b) 6

(c) DNE (∞)

(d) DNE ($-\infty$)

18) $\lim_{x \rightarrow 0} \frac{x^3 - 5x^2 - 4x}{x^2 + x}$

(a) 0

(b) 4

(c) -4

(d) DNE (∞)

19) $\lim_{x \rightarrow 2} \frac{x^3 - 2x^2 - 3x + 6}{x - 2}$

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

(a) 1

(b) DNE ($l \neq r$)

(c) DNE (∞)

(d) DNE ($-\infty$)