

Answers | 30
30

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

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

$$\frac{(x+4)(x-3)}{x+4}$$

[2]

Remov at $x = -4$

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

$$\frac{1^3 + 3(1) - 4}{1 - 1} = \frac{0}{0}$$

[2]

Remov at $x = 1$

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

$$\begin{matrix} (2, -1) \\ (2, -1) \end{matrix}$$

Continuous

[2]

2) $f(x) = \frac{x^2 - 11x + 30}{x - 8}$

$$\frac{(x-6)(x-5)}{x-8}$$

Asymp. at $x = 8$ [2]

4) $f(x) = \frac{3x^2 - 14x - 5}{x^2 - 25}$

$$\frac{(3x+1)(x-5)}{(x-5)(x+5)}$$

[4]

Remov at $x = 5$ Asymp. at $x = -5$

6) $f(x) = \begin{cases} \frac{3}{x-3} & (x < -1) \\ \frac{3}{x-3} & (x \geq -1) \end{cases}$

$$\begin{matrix} (-1, -1) \\ (-1, -\frac{3}{4}) \end{matrix}$$

Jump at $x = -1$ Asymp at $x = 3$

[4]

For questions 7-8 fill in the blank with the choice which describes the function at the point indicated.

A $\rightarrow$ the function has an Asymptotic (or infinite) discontinuityR $\rightarrow$ the function has a Removable (or point) discontinuityJ $\rightarrow$ the function has a Jump discontinuityC $\rightarrow$ the function is Continuous

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

$$\frac{x}{x(x-2)}$$

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

[1 ea]

at $x = 0$ R at $x = 1$ C at $x = 2$ C

at $x = 0$ C at $x = 1$ C at $x = 2$ A

(-1) collection in it T for both $x = 1$ w/ clear 10 mark

showing automatic error

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

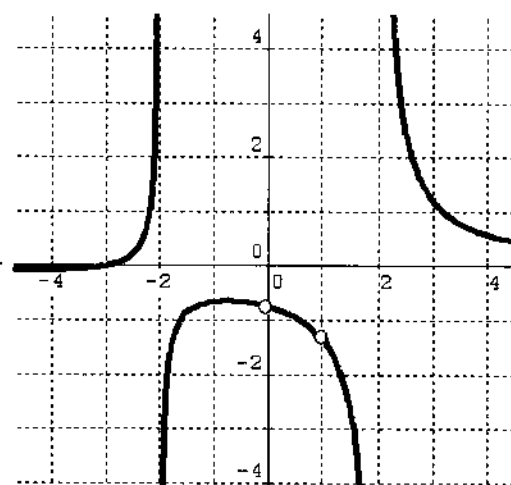
$$f(x) = \begin{cases} x^2 + 3x + 2 & x < \underline{9} \\ x^2 + 4x - 7 & x \geq \underline{9} \end{cases} \quad [2] \quad \begin{aligned} x^2 + 3x + 2 &= x^2 + 4x - 7 \\ 3x + 2 &= 4x - 7 \\ 9 &= x \end{aligned}$$

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

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

[3]

+ 1/2 ea



10) $f(x) = \frac{3x-4}{x^2+5x+4} \quad (x+4)(x+1)$

y-intercept: $\underline{-1}$ + 1/2 ea

x-intercept(s): $\underline{4/3}$

[3]

Vertical asymptote(s): $x = \underline{-4, -1}$

Horizontal asymptote(s): $y = \underline{0}$

Bonus: What value of c makes $f(x)$ a continuous function at $x=2$.

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

$$c = \frac{5}{3}$$

$$x^2(x-2) + 1(x-2)$$

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

$$+1$$