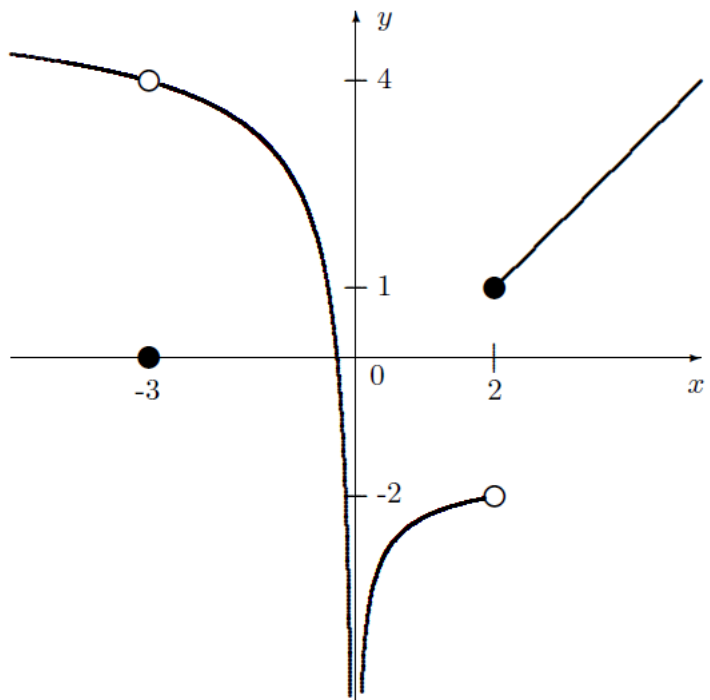


1. Use the graph of $y = f(x)$ below to determine each of the following. Label the limits as ∞ or $-\infty$ where appropriate. If the limit does not exist or the value of the function is undefined, indicate this.

/6



(a) $f(0) =$

(b) $\lim_{x \rightarrow 0^-} f(x) =$

(c) $\lim_{x \rightarrow 0^+} f(x) =$

(d) $\lim_{x \rightarrow 0} f(x) =$

(e) $f(-3) =$

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

(g) $\lim_{x \rightarrow -3^+} f(x) =$

(h) $\lim_{x \rightarrow -3} f(x) =$

(i) $f(2) =$

(j) $\lim_{x \rightarrow 2^-} f(x) =$

(k) $\lim_{x \rightarrow 2^+} f(x) =$

(l) $\lim_{x \rightarrow 2} f(x) =$

2. Evaluate each of the following limits, or indicate that the limit does not exist (assigning ∞ or $-\infty$ where appropriate), by checking one of the corresponding boxes. You may check only one box per question. If more than one box is checked you will not receive any credit for that question. If the correct answer is checked without the appropriate workings, marks will not be awarded.

Workings

/4 (a) $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x^3 + 3x^2 + 2x + 6}$

- 1
- $-\frac{3}{2}$
- $-\frac{6}{11}$
- 6
- does not exist

/4 b) $\lim_{x \rightarrow -1} \frac{4x + 4}{3 - \sqrt{8 - x}}$

- 0
- 24
- 6
- 48
- does not exist

/4 (c) $\lim_{x \rightarrow 2} \frac{5(x+3)^{-1} - (x-1)^{-1}}{x-2}$

$-\frac{24}{25}$

$\frac{4}{5}$

$\frac{1}{5}$

$-\frac{8}{25}$

does not exist

/4 (d) $\lim_{x \rightarrow 2^+} \frac{|2-x|}{x^2 - 4x + 4}$

0

$-\frac{1}{4}$

∞

$-\infty$

does not exist

/4 (e) $\lim_{x \rightarrow -\infty} \frac{3x+2}{x-\sqrt{16x^2+5}}$

-1

$\frac{3}{5}$

0

3

does not exist

4. Find all values of k for which $\lim_{x \rightarrow 4} f(x)$ exists, given

/5
$$f(x) = \begin{cases} (x+k)^2 & \text{for } x > 4 \\ k^3, & \text{for } x = 4 \\ 2x-k, & \text{for } x < 4 \end{cases}$$

/10 5. Given the function

$$f(x) = \begin{cases} \frac{4x^2}{x^2 - 5x}, & \text{for } x < 3 \\ 0, & \text{for } x = 3 \\ \frac{6}{x-4}, & \text{for } x > 3 \end{cases}$$

use the definition of continuity to determine the points at which $f(x)$ is not continuous.

Classify any discontinuities as removable or non-removable.

/8 6. Identify all horizontal and vertical asymptotes (if any) of the graph of

$$f(x) = \frac{6x^2 - 24}{3x^2 - 7x + 2}.$$

Bonus: (2 marks)

For some unknown function $f(x)$, we are told that $\lim_{x \rightarrow 0} \frac{f(x) - 3}{5x} = 7$.

Can $\lim_{x \rightarrow 0} f(x)$ be determined using only this information? Explain your answer.