

## MCS21 Homework 10

1. Find a value for the constant  $k$ , if possible, that will make the function continuous.

$$(a) f(x) = \begin{cases} 7x-2 & x \leq 1 \\ kx^2 & x > 1 \end{cases} \quad (b) f(x) = \begin{cases} kx^2 & x \leq 2 \\ 2x+k & x > 2 \end{cases}$$

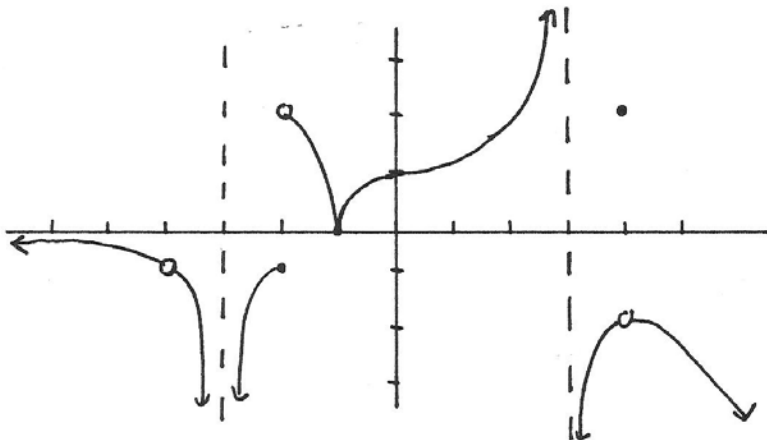
2. On which of the following intervals is  $f(x) = \frac{1}{\sqrt{x-2}}$  continuous? *Justify your answer.*

- (a)  $[2, +\infty)$       (b)  $(-\infty, +\infty)$   
 (c)  $(2, +\infty)$       (d)  $[1, 2)$

3. Use the definition of continuity to determine whether the function below is continuous at  $x = 3$  and at  $x = -3$ . *Justify your answer using the definition of continuity.*

$$f(x) = \begin{cases} \frac{x^3 - 27}{x^2 - 9} & x \neq 3 \\ \frac{9}{2} & x = 3 \end{cases}$$

4. Refer to the graph of  $f(x)$  shown below.



State all  $x$ -values where  $f(x)$  is discontinuous. For each point of discontinuity, state whether the discontinuity is removable or non-removable.

5. Find each limit.

$$(a) \lim_{x \rightarrow -\infty} \frac{\sqrt{9x^6 - x}}{x^3 + 1} \quad (b) \lim_{x \rightarrow -\infty} \frac{x}{\sqrt[4]{x^4 + 1}}$$

6. Find the value of  $a$  and  $b$  so that  $f(x)$  is continuous.

$$f(x) = \begin{cases} ax-1 & x < -1 \\ -x^2+1 & -1 \leq x < 2 \\ \frac{1}{2}x+b & x \geq 2 \end{cases}$$