MCS21 Homework 9

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

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

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

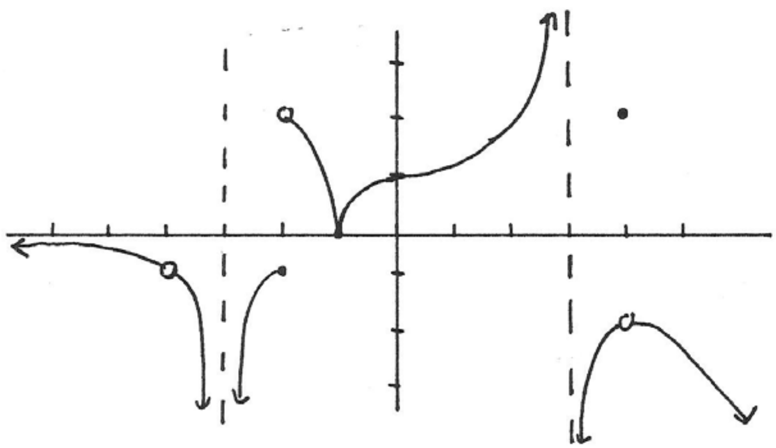
(a) $[2, +\infty)$ (b) $(-\infty, +\infty)$

(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.*

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

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) $\lim\limits_{x\to-\infty}\dfrac{\sqrt{9x^6-x}}{x^3+1}$ (b) $\lim\limits_{x\to-\infty}\dfrac{x}{\sqrt[4]{x^4+1}}$

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

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