Chapter 9 Continuity Ex 9.2 Q18

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

$$\lim_{x\to -2^-} f(x)=\lim_{h\to 0}\frac{1}{-2-h+2}=\lim_{h\to 0}-\frac{1}{h}\to -\infty$$

$$\lim_{x\to -2^+} f(x)=\lim_{h\to 0}\frac{1}{-2+h+2}=\lim_{h\to 0}\frac{1}{h}\to \infty$$

$\therefore f(x)$ is discontinuous at $x = -2$

$$\text{Let } g(x)=f(f(x))=\frac{x+2}{2x+5}$$

$$\lim_{x\to -\frac{5}{2}^-} g(x)=\lim_{h\to 0}\frac{-\frac{5}{2}-h+2}{-5-h+5}=\lim_{h\to 0}-\frac{-\frac{5}{2}-h+2}{h}\to -\infty$$

$$\lim_{x\to -\frac{5}{2}^+} f(x)=\lim_{h\to 0}\frac{-\frac{5}{2}+h+2}{-5+h+5}=\lim_{h\to 0}\frac{-\frac{5}{2}-h+2}{h}\to \infty$$

$\therefore g(x)$ is discontinuous at $x=-\frac{5}{2}$

$\therefore f(f(x))$ is discontinuous at $x=-\frac{5}{2}$

$\therefore f(x)$ is discontinuous at $x = -2$ and $-\frac{5}{2}$.

Chapter 9 Continuity Ex 9.2 Q19

$$f(t)=\frac{1}{t^2+t-2}, \text{ where } t=\frac{1}{x-1}$$

Clearly $t=\frac{1}{x-1}$ is discontinuous at $x = 1$.

For $x \neq 1$, we have

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

This is discontinuous at $t = -2$ and $t = 1$

For $t = -2$, $t=\frac{1}{x-1}\Rightarrow x=\frac{1}{2}$

For $t = 1$, $t=\frac{1}{x-1}\Rightarrow x=2$

Hence f is discontinuous at $x=\frac{1}{2}$, $x = 1$ and $x = 2$.

********** END **********