2.1

22) $\lim_{x \to 0} \dfrac{\frac{1}{2+x} - \frac{1}{2}}{x}$

$\lim_{x \to 0} \dfrac{\frac{2-(2+x)}{2(2+x)}}{x} \to \dfrac{\frac{-x}{2(2+x)}}{x}$

$\lim_{x \to 0} \dfrac{-\cancel{x}}{2(2+x)} \cdot \dfrac{1}{\cancel{x}}$

$\lim_{x \to 0} \dfrac{-1}{2(2+x)} = \boxed{-\frac{1}{4}}$

$$\begin{array}{ccccccc} & & & 1 & & & 0 \\ & & 1 & & 1 & & 1 \\ & 1 & & 2 & & 1 & 2 \\ \boxed{1} & & 3 & & 3 & \boxed{1} & 3 \end{array}$$

23) $\lim_{x \to 0} \dfrac{(2+x)^3 - 8}{x}$

$\lim_{x \to 0} \dfrac{\cancel{8} + 4x \cdot 3 + 2x^2 \cdot 3 + x^3 - \cancel{8}}{x}$

$\lim_{x \to 0} \dfrac{\cancel{x}(12 + 6x + x^2)}{\cancel{x}}$

$\lim_{x \to 0} 12 + 6x + x^2 = \boxed{12}$

2.1

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

27] $\lim_{x \to 0} \frac{\sin^2 x}{x}$

$\lim_{x \to 0} \frac{\sin x}{x} \cdot \sin x$

$\lim_{x \to 0} \frac{\sin x}{x} \cdot \lim_{x \to 0} \sin x$

$1 \cdot 0 = \boxed{0}$

59] $\lim_{x \to 0} x \sin x = \boxed{0}$

$-x \leq x \sin x \leq x$

$\lim_{x \to 0} -x = 0$ $\lim_{x \to 0} x = 0$

19] $\lim_{x \to 1} \frac{x-1}{x^2-1}$

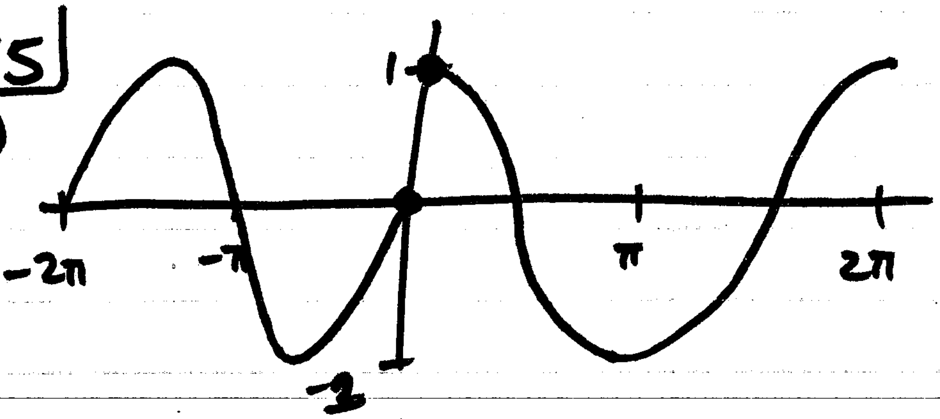
$\lim_{x \to 1} \frac{\cancel{x-1}}{(x+1)\cancel{(x-1)}}$

$\lim_{x \to 1} \frac{1}{x+1} = \boxed{\frac{1}{2}}$

2.1

55

(a)

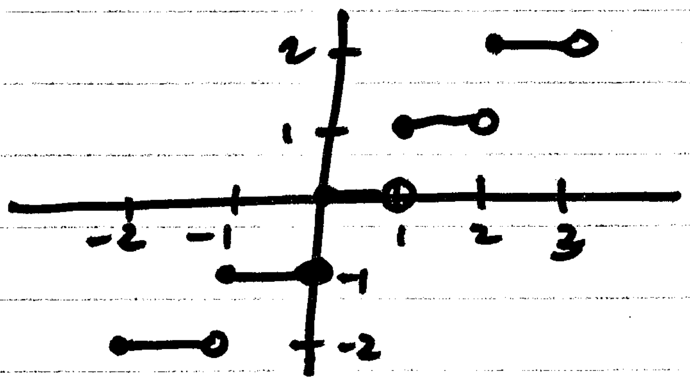


(b) $(-2\pi, 0) \cup (0, 2\pi)$

(c) 2π

(d) -2π

GIF [[x]] int x



2.1

60) $\lim_{x \to 0} x^2 \sin x = 0$ $-x^2 \le x^2 \sin x \le x^2$

$\lim_{x \to 0} -x^2 = 0$ $\lim_{x \to 0} x^2 = 0$

BECAUSE $-1 \le \sin x \le 1$, $-x^2 \le x^2 \sin x \le x^2$. BY THE SANWICH THEOREM, SINCE $\lim_{x \to 0} -x^2 = 0$ AND $\lim_{x \to 0} x^2 = 0$, $\lim_{x \to 0} x^2 \sin x = 0$.