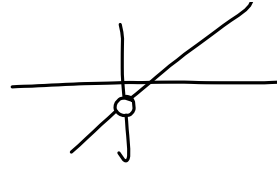


**1.3 Evaluating Limits Analytically**

$$42. h(x) = \frac{x^2 - 3x}{x} = \frac{x(x-3)}{x}$$



$$(a) \lim_{x \rightarrow -2} h(x) = \frac{(-2)^2 - 3(-2)}{-2} = \frac{4+6}{-2} = \frac{10}{-2} = \boxed{-5}$$

$$(b) \lim_{x \rightarrow 0} h(x) = \frac{0^2 - 3(0)}{0} = \frac{0}{0} \text{ ;}$$

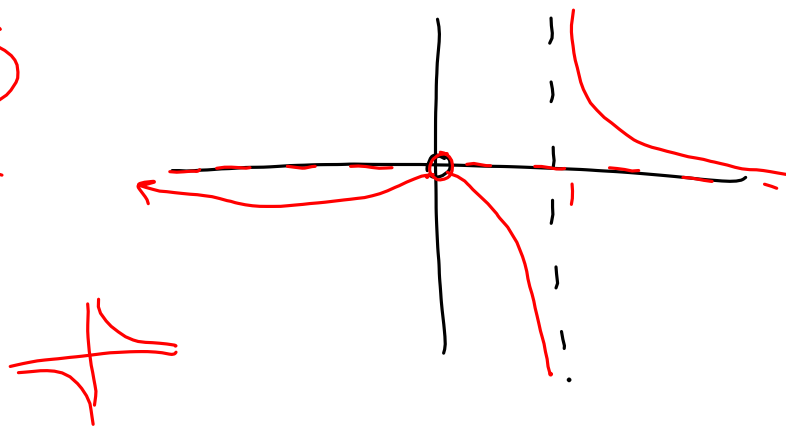
$$\lim_{x \rightarrow 0} (x-3) = \boxed{-3}$$

$$44. \lim_{x \rightarrow 1} \frac{x}{x^2 - x} = \frac{1}{1-1} = \frac{1}{0} \quad \frac{-3}{9+3} \quad \frac{-1/2}{1/4 + 1/2}$$

$$= \lim_{x \rightarrow 1} \frac{x}{x(x-1)}$$

end behavior

$$\frac{x}{x^2} = \frac{1}{x}$$



$$48. \lim_{x \rightarrow -1} \frac{x^3 + 1}{x + 1} \quad \frac{0}{0}$$

$$a^3 + b^3 \neq (a+b)^3$$

$$|| \quad a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a+b)(a^2 - ab + b^2)$$

$$= \lim_{x \rightarrow -1} \frac{\cancel{x+1}(x^2 - x + 1)}{\cancel{x+1}}$$

$$= (-1)^2 - (-1) + 1 = 1 + 1 + 1 = \boxed{3}$$

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$$\begin{array}{r} -1 \overline{) 1 \quad 0 \quad 0 \quad 1} \\ \underline{-1 \quad 0 \quad 0 \quad 1} \\ 0 \quad 0 \quad 0 \quad 0 \end{array}$$


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$$x^2 - 1x + 1 \quad | \quad 0$$

$$54. \lim_{x \rightarrow 0} \frac{\sqrt{2+x} - \sqrt{2}}{x} \cdot \frac{\sqrt{2+x} + \sqrt{2}}{\sqrt{2+x} + \sqrt{2}}$$

$$= \lim_{x \rightarrow 0} \frac{\cancel{\sqrt{2+x}} - \sqrt{2}}{x(\sqrt{2+x} + \sqrt{2})}$$

$$= \frac{1}{\sqrt{2+0} + \sqrt{2}} = \boxed{\frac{1}{2\sqrt{2}}}$$

$$\begin{aligned}
 58. \quad \lim_{x \rightarrow 0} \frac{\frac{1}{x+4} - \frac{1}{4}}{x} &= \lim_{x \rightarrow 0} \frac{\frac{4 \cdot 1}{4(x+4)} - \frac{1 \cdot (x+4)}{4(x+4)}}{\left(\frac{x}{1}\right)} \\
 &= \lim_{x \rightarrow 0} \frac{\cancel{4} - x = \cancel{4}}{4(x+4)} \cdot \frac{1}{x} \\
 &= \lim_{x \rightarrow 0} \frac{-\cancel{x}}{4\cancel{x}(x+4)} = \frac{-1}{4(0+4)} = \boxed{\frac{-1}{16}}
 \end{aligned}$$

$$\begin{aligned}
 66. \quad \lim_{x \rightarrow 2} \frac{x^5 - 32}{x - 2} & \quad x^5 - 2^5 \neq (x-2)^5 \\
 & \lim_{x \rightarrow 2} (x^4 + 2x^3 + 4x^2 + 8x + 16) = \boxed{80} \\
 & \begin{array}{r}
 x-2 \overline{) x^5 - 32} \\
 \underline{-(x^5 - 2x^4)} \\
 2x^4 - 32 \\
 \underline{-(2x^4 - 4x^3)} \\
 4x^3 - 32 \\
 \underline{-(4x^3 - 8x^2)} \\
 8x^2 - 32 \\
 \underline{-(8x^2 - 16x)} \\
 16x - 32 \\
 \underline{-(16x - 32)} \\
 0
 \end{array}
 \end{aligned}$$