#4) Asymptotes

$$y(x) = \frac{x^2 + 5x + 4}{(x-3)}$$

Graph the function.

Solution

Vertical Asymptotes

$$x = 3$$

⇒ slant Asymptote

Since the degree in the numerator is one more than the degree in the denominator, a slant asymptote exists.

#4

Asymptotes

$x = 3$	1	5	4
		3	24
	1	8	28

$$y(x) = (x+8) + \frac{28}{x-3}$$

As $x \to \pm\infty$, $\frac{28}{x-3} \to 0$

our slant asymptote is

$$y(x) = x + 8$$

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(#4) Asymptotes

Y-intercept, $x=0$

$$y(0)=\frac{-4}{3} \quad ; \quad (0,-1\tfrac{1}{3})$$

x-intercept, $y=0$

$$\frac{x^2+5x+4}{x-3}=0$$

$$x^2+5x+4=0$$

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#4) Asymptotes

$$(x+1)(x+4)=0$$

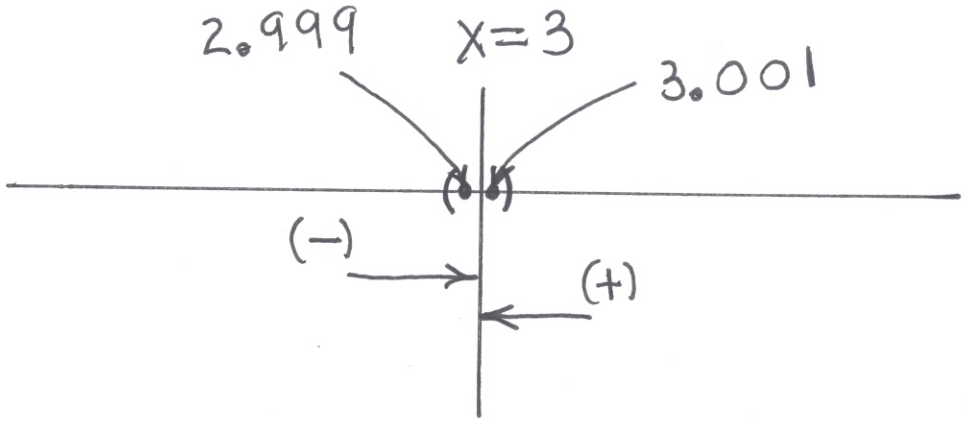
$$x=-1 \quad \& \quad x=-4$$

$$(-1,0) \quad \& \quad (-4,0)$$

we found that $x=3$ is a vertical asymptote.
we must analyze the behavior of $y(x)$
for x-values very, very close to $x=3$.

Asymptotes

(#4)



$$\lim_{x \to 3^-} \frac{(x+1)(x+4)}{x-3} \Longrightarrow \frac{(+)(+)}{(-)} \Rightarrow (-)$$

$$\lim_{x \to 3^-} y(x) \Longrightarrow -\infty$$

(#4) Asymptotes

$$\lim_{x \to 3^+} \frac{(x+1)(x+4)}{(x-3)} \Rightarrow \frac{(+)(+)}{(+)} \Rightarrow (+)$$

$$\lim_{x \to 3^+} y(x) \Rightarrow +\infty$$

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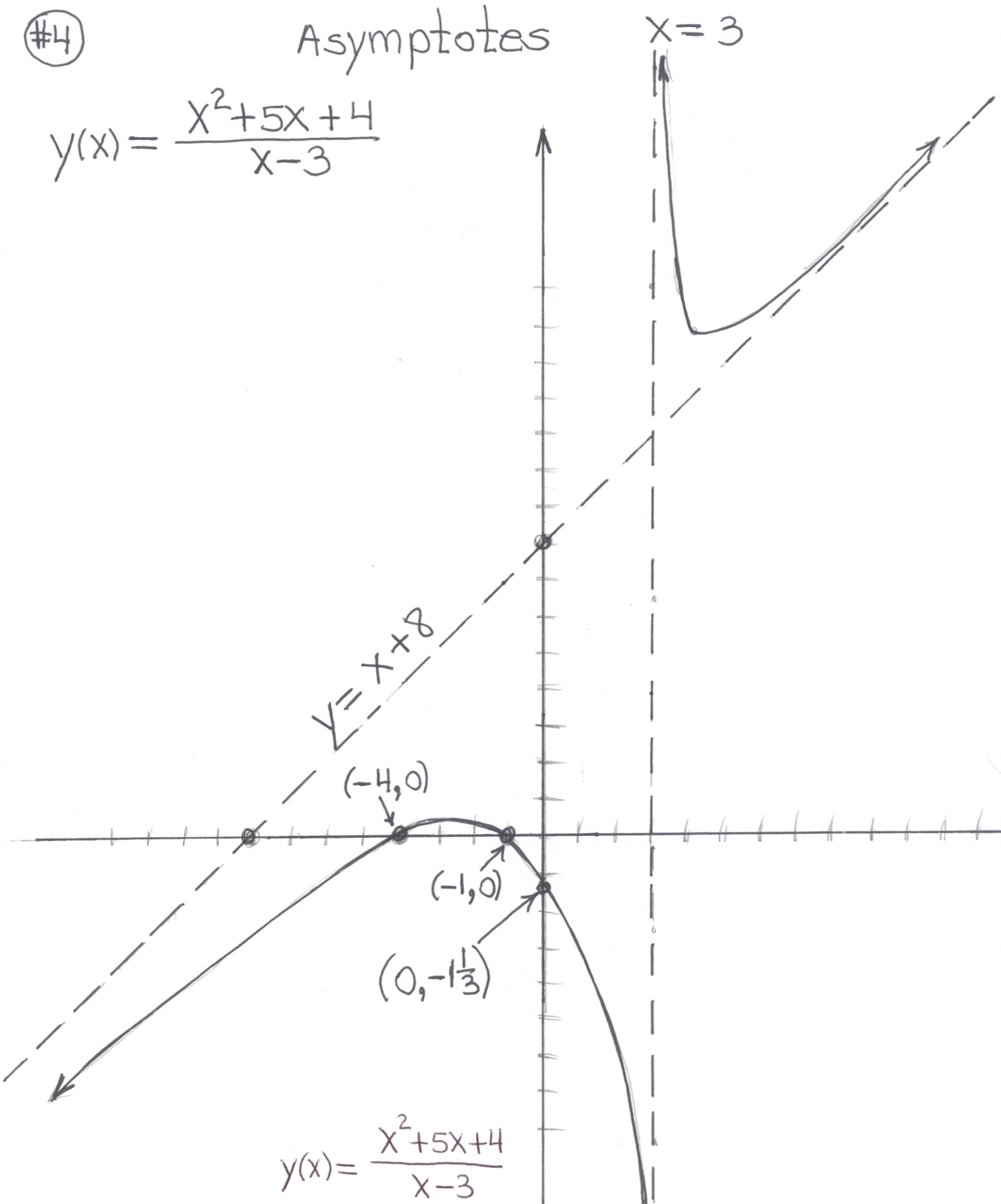
#4 Asymptotes

$y(x) = \frac{x^2+5x+4}{x-3}$



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