Sec 3.5
Asymptotic behavior & domain restrictions

Determine the domain of each:

$f(x) = \frac{3x}{x-4}$

$(-\infty, 4) \cup (4, \infty)$

$d = \{x \mid x \in \mathbb{R}, x \neq 4\}$

$f(x) = \frac{4}{(x-2)(x+3)}$

$(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$

$d = \{x \mid x \in \mathbb{R}, x \neq -3, 2\}$

*use set and interval notation

$$f(x)=\frac{6x}{x^2-81}$$

$x^2-81=0$

$x^2=81 \rightarrow x=\pm 9$

$(-\infty,-9)\cup(-9,9)\cup(9,\infty)$

$d=\{x \mid x\in\mathbb{R}, x\neq\pm 9\}$

$$f(x)=\frac{5x^2}{x^2+9}$$

$x^2+9=0$

$\sqrt{x^2}=\sqrt{-9}$

$\mathbb{R}$

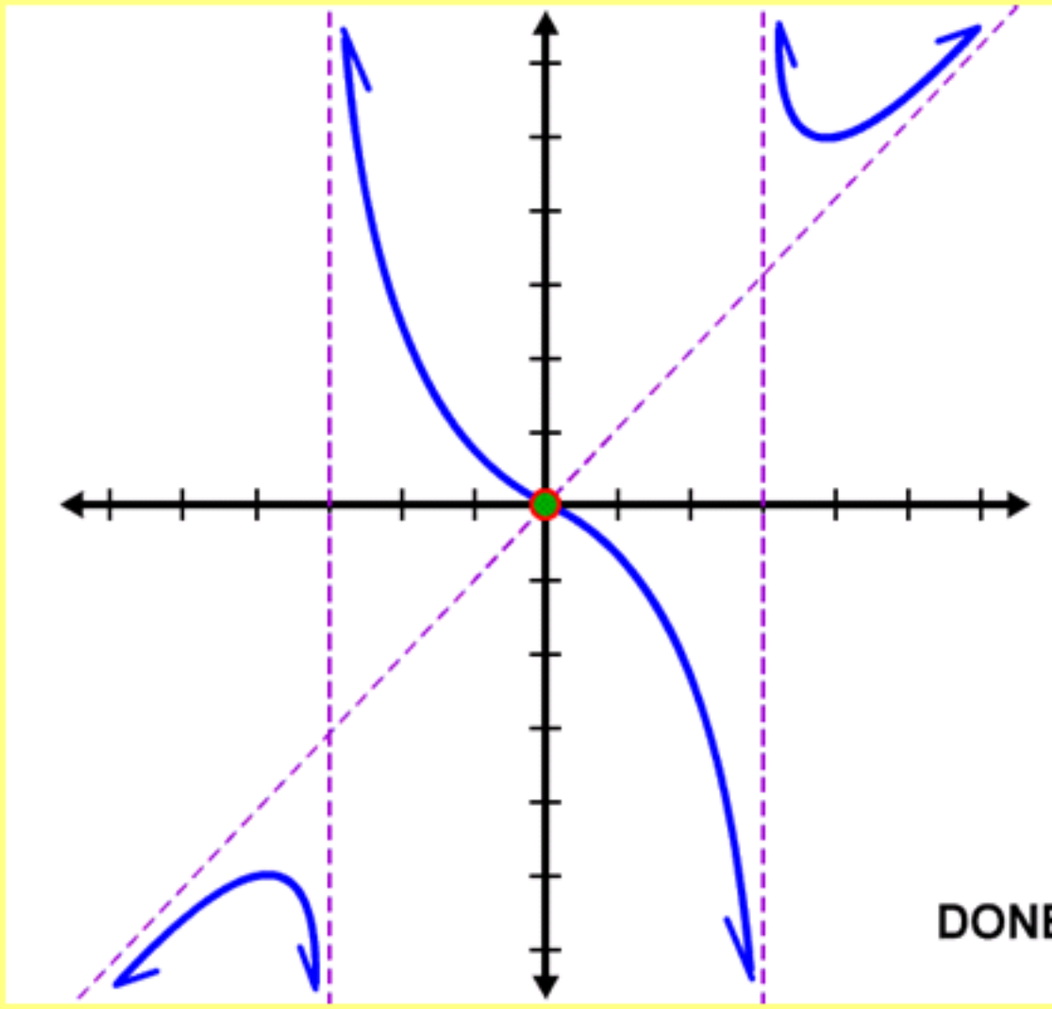
$(-\infty,\infty)$

Asymptotic Behavior

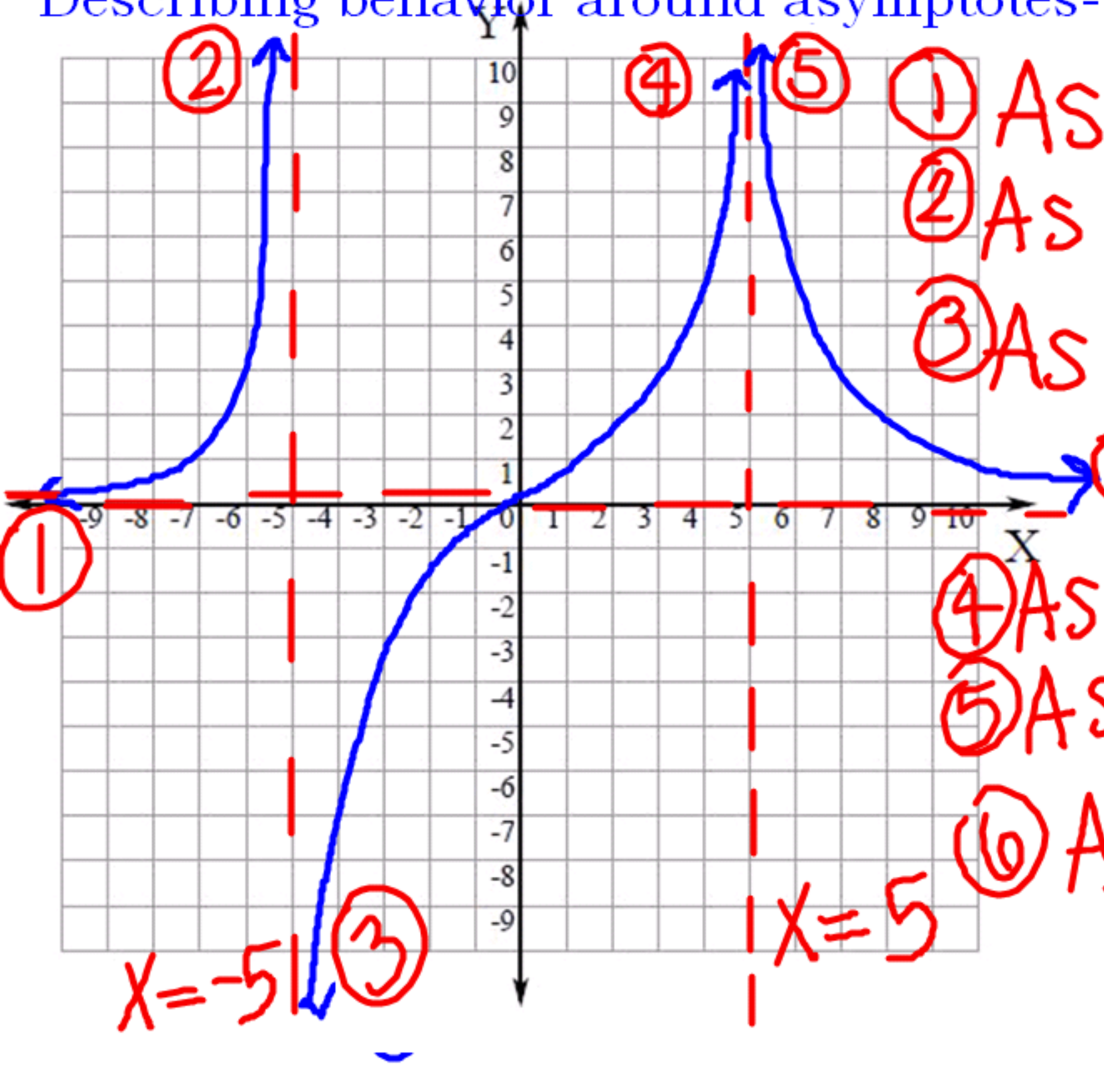
Asymptotes act like boundaries on a graph.

On both sides, the graph will approach either negative or positive infinity.

First, we'll just describe the graph's behavior. Later, we'll find the asymptotes and graph them.



Describing behavior around asymptotes-



① As $x \to -\infty, y \to 0$

② As $x \to -5^-, y \to \infty$

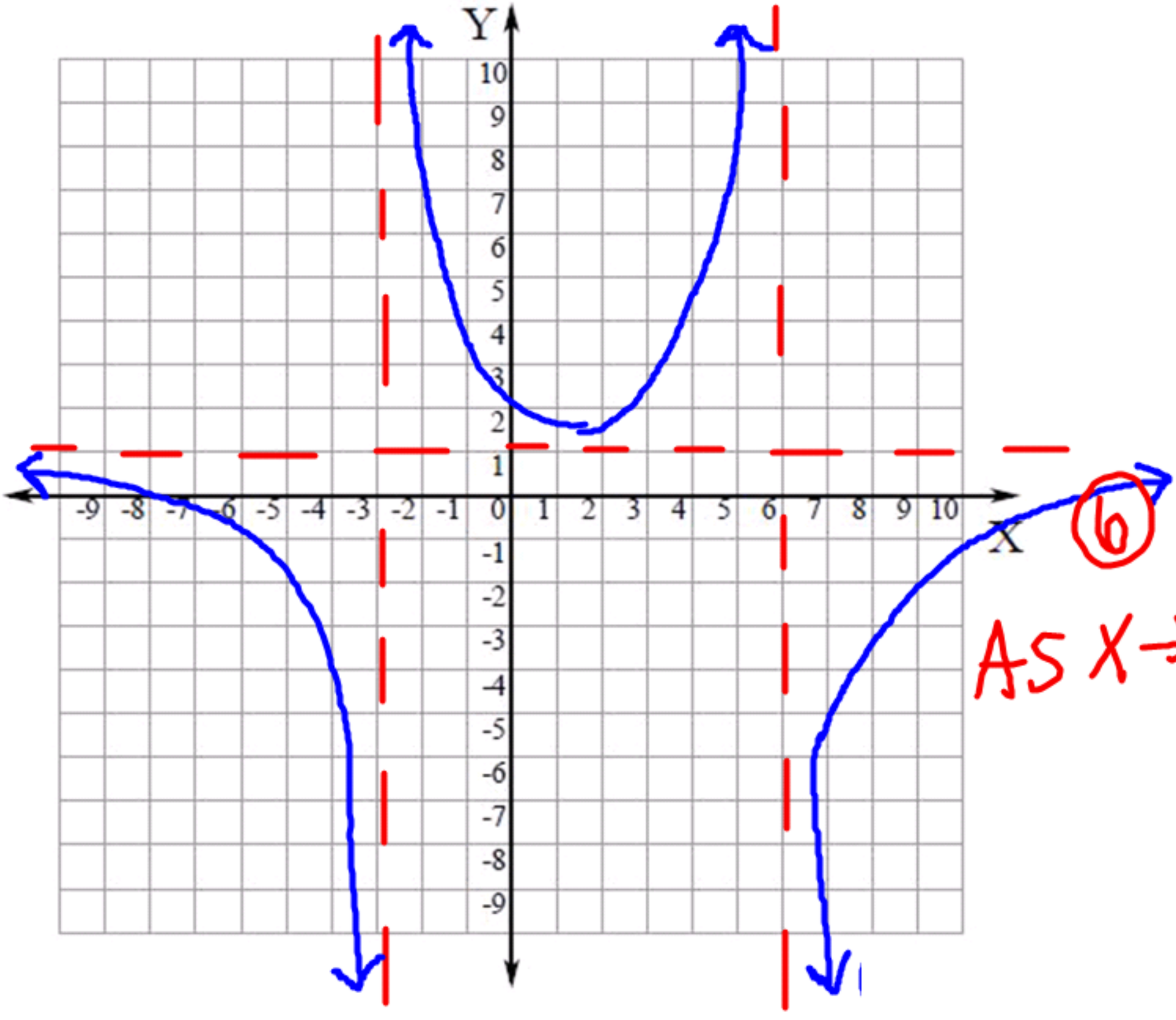
③ As $x \to -5^+, y \to -\infty$

④ As $x \to 5^-, y \to \infty$

⑤ As $x \to 5^+, y \to \infty$

⑥ As $x \to \infty, y \to 0$

$\therefore$



(6)

As $x \to \infty, y \to 1$

Suggested Practice
Section 3.5, page 406
1,3,5,7
15-20

1. $\{ x \mid x \neq 4 \}$ → $(-\infty, 4) \cup (4, \infty)$
3. $\{ x \mid x \neq 5, x \neq -4 \}$ $(-\infty, -4) \cup (-4, 5) \cup (5, \infty)$
5. $\{ x \mid x \neq 7, x \neq -7 \}$ $(-\infty, -7) \cup (-7, 7) \cup (7, \infty)$
7. $\{ x \mid x \in R \}$ $(-\infty, \infty)$

15. ∞
16. $-\infty$
17. $-\infty$
18. ∞
19. 1
20. 1