

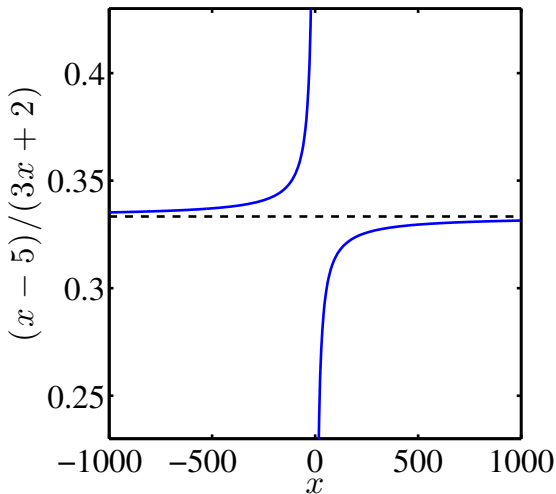
# MATH104-921, Asymptotes

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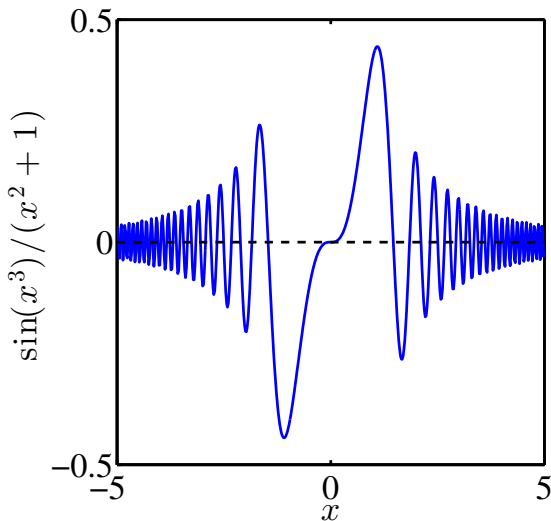
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limit as  $x \rightarrow \infty$ 

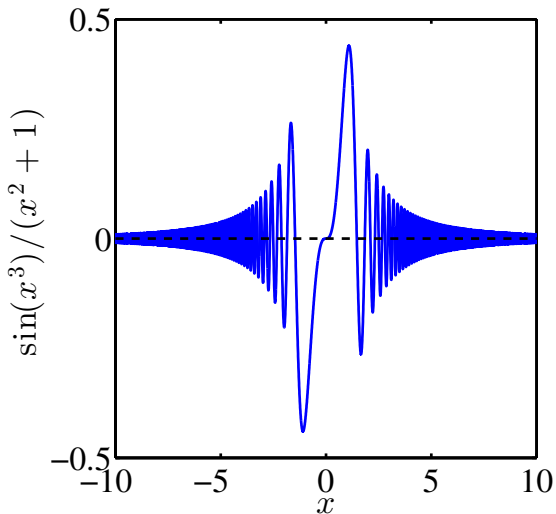
$$y = \frac{x - 5}{3x + 2}$$

dashed line is  $y = 1/3$ .

limit as  $x \rightarrow \infty$ 

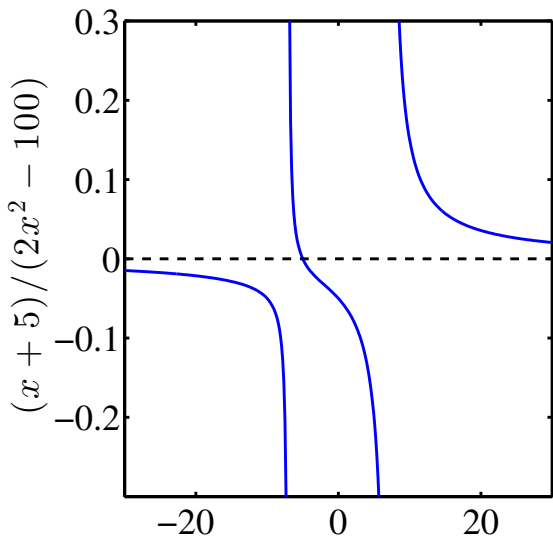
$$y = \frac{\sin(x^3)}{x^2 + 1}$$

dashed line is  $y = 0$ .

limit as  $x \rightarrow \infty$ 

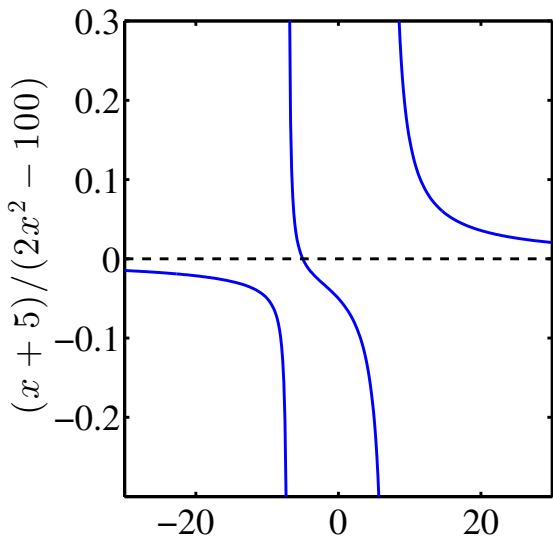
$$y = \frac{\sin(x^3)}{x^2 + 1}$$

dashed line is  $y = 0$ .

limit as  $x \rightarrow \infty$ 

$$y = \frac{x + 5}{2x^2 - 100}$$

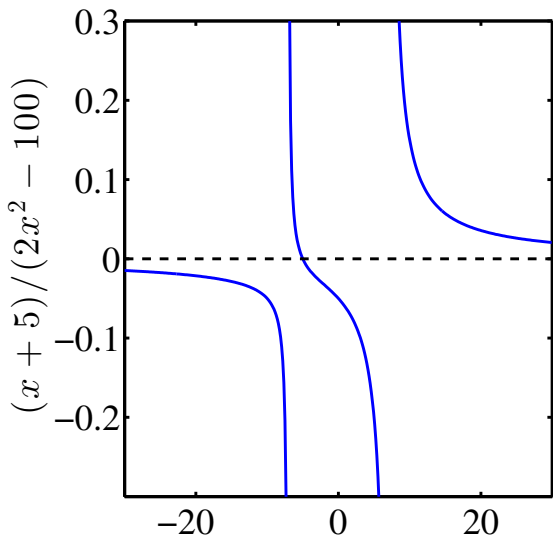
Dashed line is  $y = 0$ .

limit as  $x \rightarrow \infty$ 

$$y = \frac{x + 5}{2x^2 - 100}$$

Dashed line is  $y = 0$ .

*An asymptote is a line or curve that approaches a given curve arbitrarily closely.*

limit as  $x \rightarrow \infty$ 

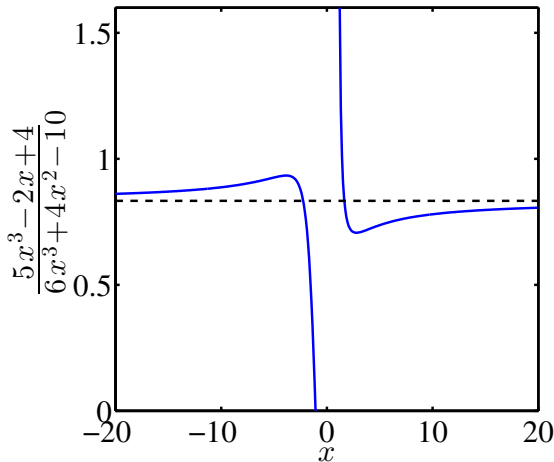
$$y = \frac{x + 5}{2x^2 - 100}$$

Dashed line is  $y = 0$ .

*An asymptote is a line or curve that approaches a given curve arbitrarily closely.*

$y = 0$  is a horizontal asymptote.

# Horizontal Asymptotes

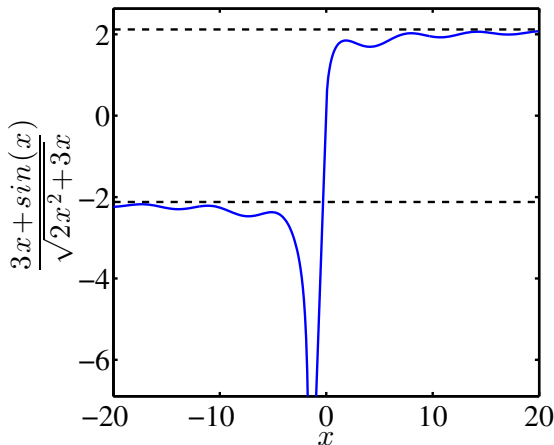


$$y = \frac{5x^3 - 2x + 4}{6x^3 + 4x^2 - 10}$$

dashed line,  $y = 0$ , is a horizontal asymptote.



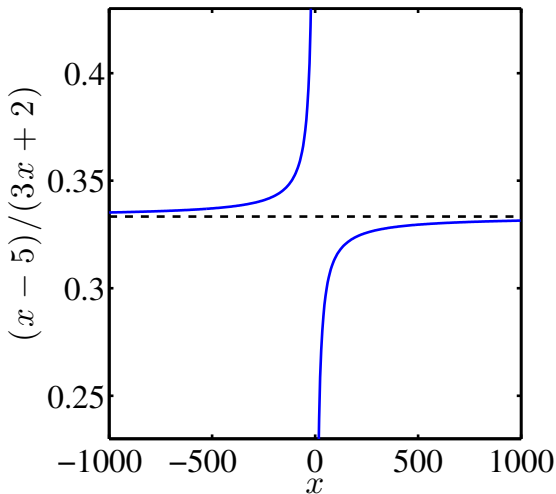
# Horizontal Asymptotes



$$y = \frac{3x + \sin(x)}{\sqrt{2x^2 + 3x}}$$

dashed lines,  $y = \pm 3/\sqrt{2}$ ,  
are the horizontal  
asymptotes.

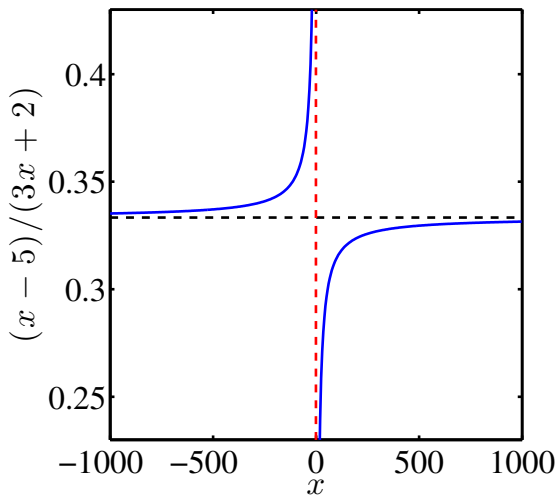
# Other asymptotes?



$$y = \frac{x - 5}{3x + 2}$$

black dashed line,  $y = 0$ , is the horizontal asymptote.

# Other asymptotes?

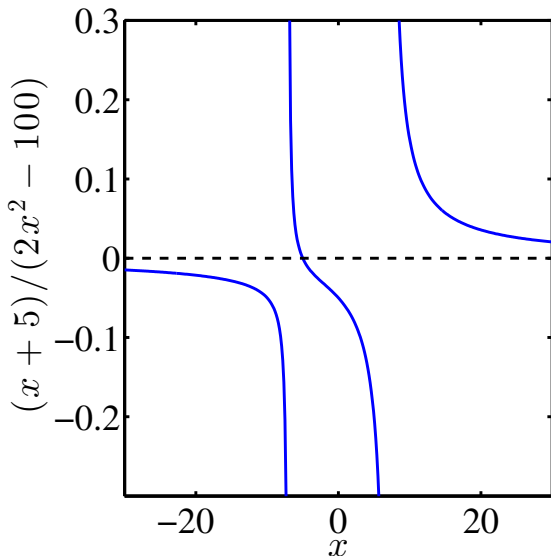


$$y = \frac{x - 5}{3x + 2}$$

black dashed line,  $y = 0$ , is the horizontal asymptote.

red dashed line is a vertical asymptote:  
 $x = -1/3$

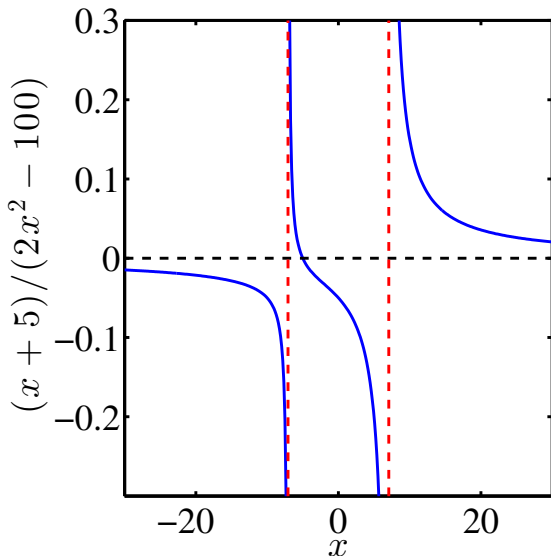
# Horizontal and Vertical Asymptotes



$$y = \frac{x + 5}{2x^2 - 100}$$

black dashed line is the horizontal asymptote.

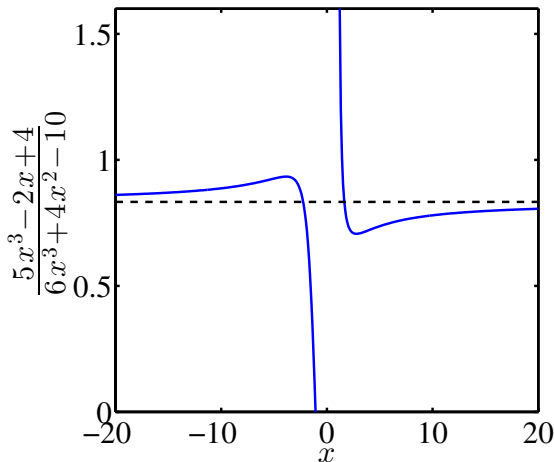
# Horizontal and Vertical Asymptotes



$$y = \frac{x + 5}{2x^2 - 100}$$

black dashed line is the horizontal asymptote.  
red dashed lines are the vertical asymptotes.

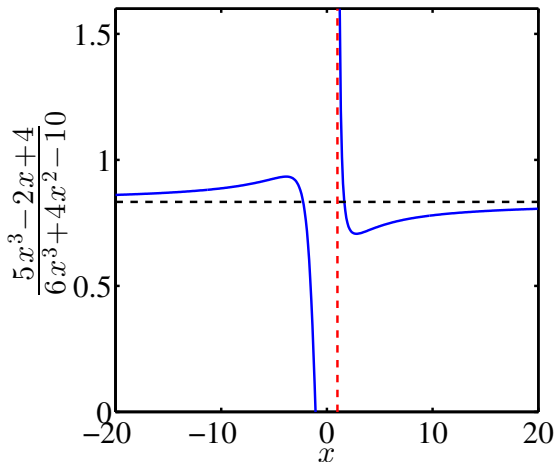
# Horizontal and Vertical Asymptotes



$$y = \frac{5x^3 - 2x + 4}{6x^3 + 4x^2 - 10}$$

black dashed line is a horizontal asymptote.

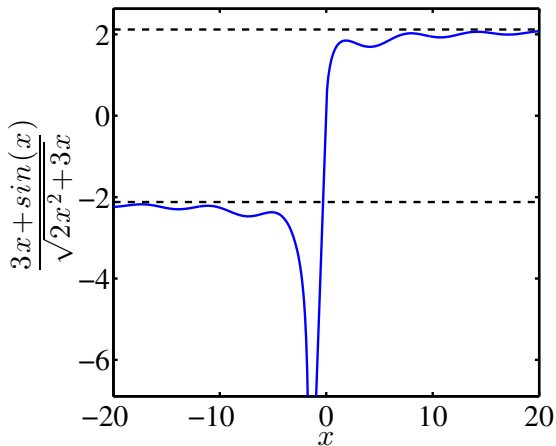
# Horizontal and Vertical Asymptotes



$$y = \frac{5x^3 - 2x + 4}{6x^3 + 4x^2 - 10}$$

black dashed line is a horizontal asymptote. red dashed line is a vertical asymptote.

# Horizontal and Vertical Asymptotes

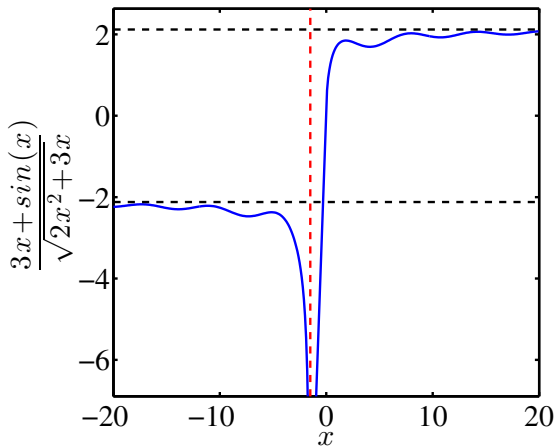


$$y = \frac{3x + \sin(x)}{\sqrt{2x^2 + 3x}}$$

black dashed lines are the horizontal asymptotes.



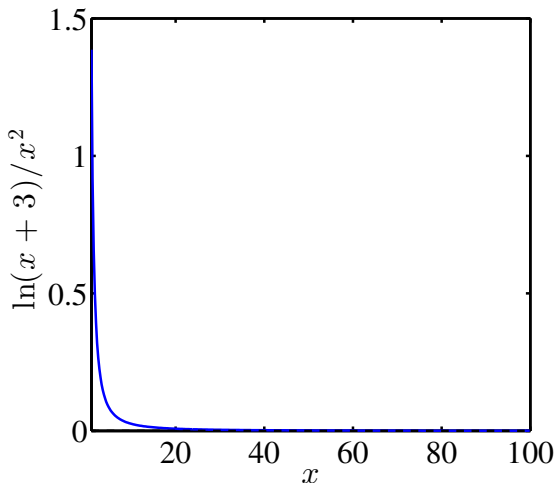
# Horizontal and Vertical Asymptotes



$$y = \frac{3x + \sin(x)}{\sqrt{2x^2 + 3x}}$$

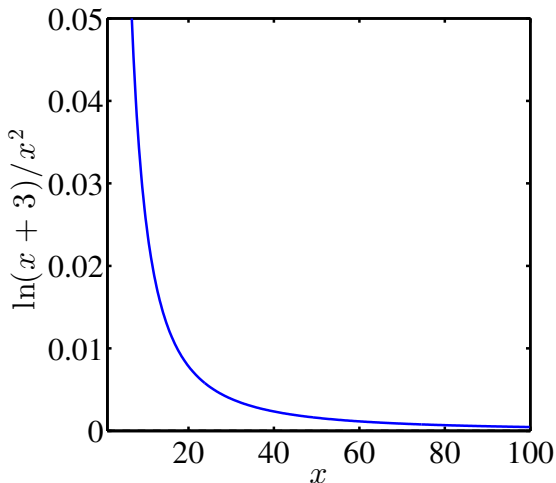
black dashed lines are the horizontal asymptotes.  
red dashed line is a vertical asymptote.

# Horizontal and Vertical Asymptotes



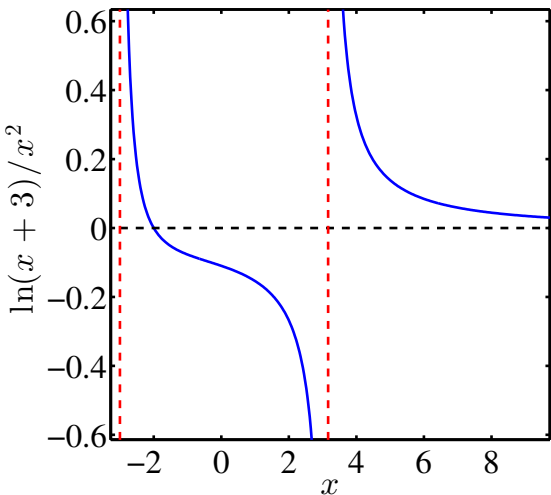
$$y = \frac{\ln(x+3)}{x^2}$$

# Horizontal and Vertical Asymptotes



$$y = \frac{\ln(x+3)}{x^2}$$

# Horizontal and Vertical Asymptotes



$$y = \frac{\ln(x+3) - 2}{x^2 - 10}$$

black dashed line is the horizontal asymptote.  
red dashed lines are vertical asymptotes.