

A vibrant lorikeet with a red head, yellow and blue patterned wings, and a yellow breast is perched on a branch. The background is filled with green foliage and several bright red bottlebrush flowers. The text "limits of piecewise functions" is overlaid in the center in a black, handwritten-style font.

limits of piecewise  
functions

# piecewise-defined functions

- FIND THE ONE-SIDED LIMITS OF A PIECEWISE-DEFINED FUNCTION.
- DISTINGUISH BETWEEN THE EQUATION FORMS, THE LIMITS, AND THE TYPES OF DISCONTINUITY.
- LANGUAGE OBJECTIVES:
  - DESCRIBE THE RELATIONSHIP BETWEEN A GRAPH DISCONTINUITY AND ITS FUNCTION.

# types of discontinuities

- WHAT ARE THE TYPES OF EQUATIONS?

- HOLE (REMOVABLE DISCONTINUITY)

- VERTICAL ASYMPTOTE

- JUMP DISCONTINUITY



# example 1

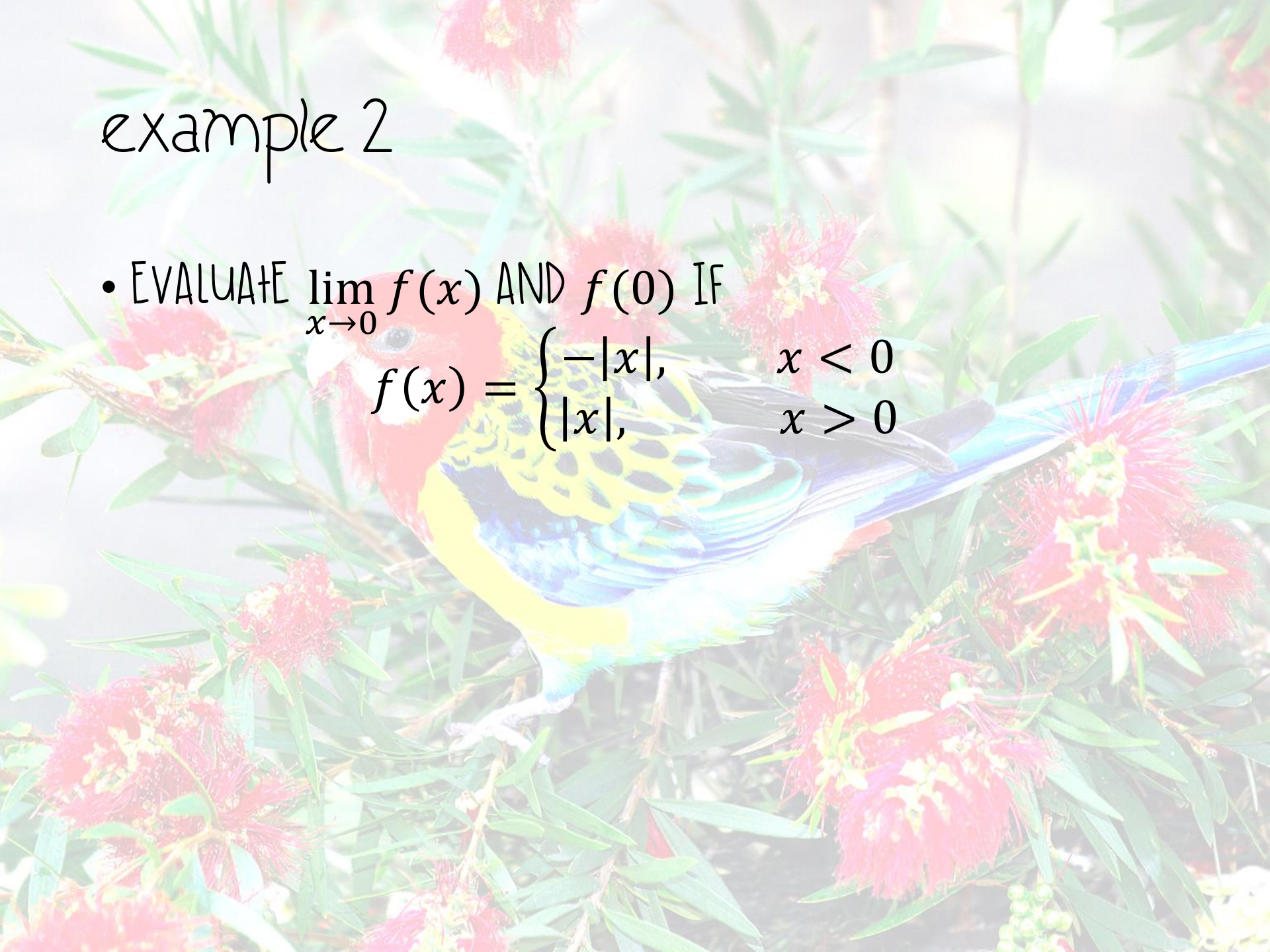
- EVALUATE  $\lim_{x \rightarrow 2} f(x)$  AND  $f(2)$  IF

$$f(x) = \begin{cases} \sqrt{3 + 5}, & x < 2 \\ \sqrt{2x - 4}, & x \geq 2 \end{cases}$$

## example 2

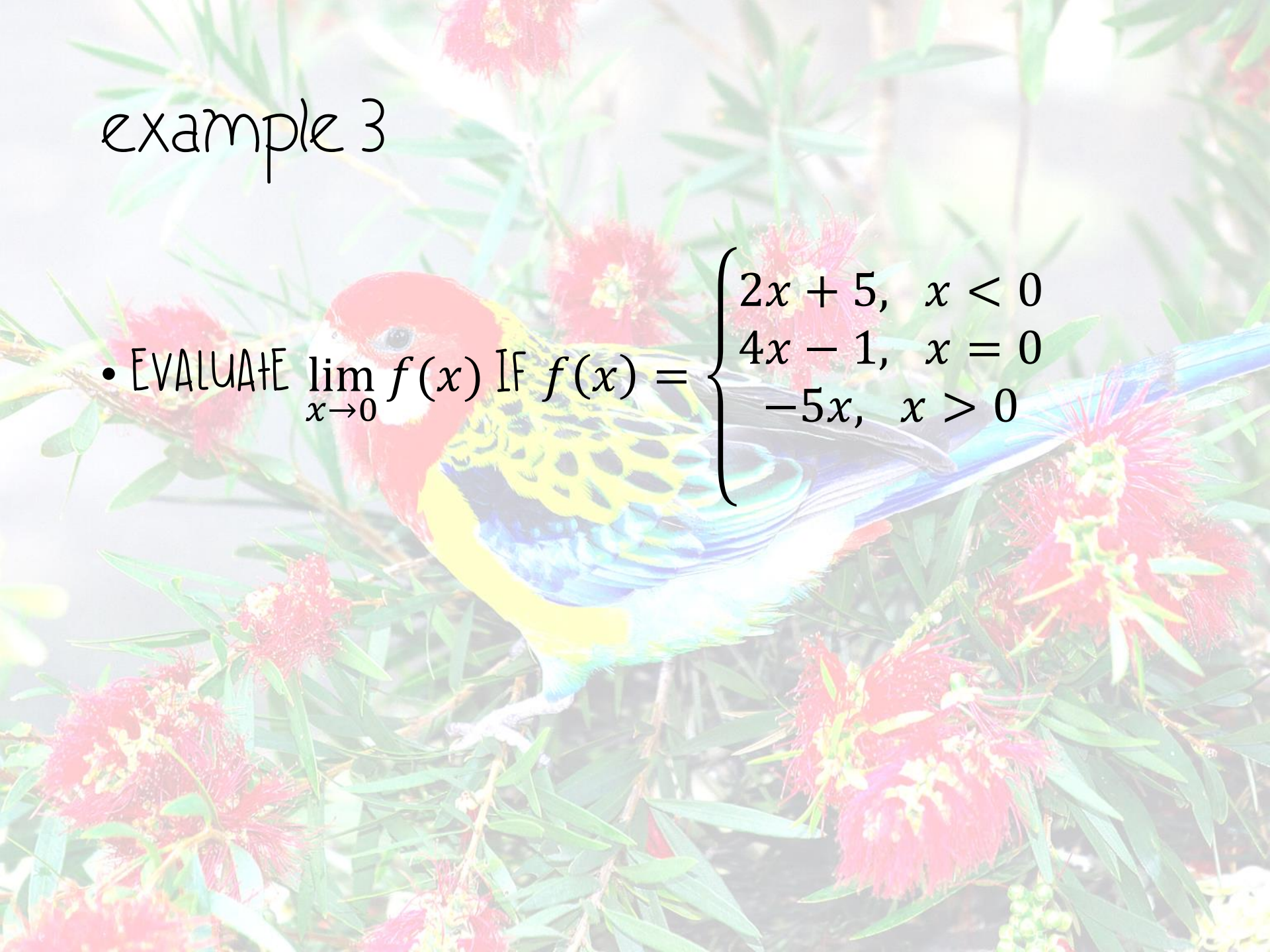
- EVALUATE  $\lim_{x \rightarrow 0} f(x)$  AND  $f(0)$  IF

$$f(x) = \begin{cases} -|x|, & x < 0 \\ |x|, & x > 0 \end{cases}$$



# example 3

• EVALUATE  $\lim_{x \rightarrow 0} f(x)$  IF  $f(x) = \begin{cases} 2x + 5, & x < 0 \\ 4x - 1, & x = 0 \\ -5x, & x > 0 \end{cases}$

A vibrant lorikeet with a red head, yellow and blue patterned wings, and a blue tail is perched on a branch. The background is filled with green leaves and several bright red bottlebrush flowers.

# practice problems

## 2.5.4 Practice Problems

1. Evaluate  $\lim_{x \rightarrow -2} f(x)$  if  $f(x) = \begin{cases} 3x - 5x^2, & x < -2 \\ 13x, & x > -2 \end{cases}$

2. Evaluate  $\lim_{x \rightarrow 3} f(x)$  and  $f(3)$  if  $f(x) = \begin{cases} \sin(\frac{\pi x}{3}), & x < 3 \\ 4, & x = 3 \\ \cos(\frac{\pi x}{3}) + 1, & x > 3 \end{cases}$

3. Evaluate  $\lim_{x \rightarrow 7} f(x)$  and  $f(7)$  if  $f(x) = \begin{cases} x, & x > 7 \\ \frac{x}{x-7}, & x \leq 7 \end{cases}$

4. Evaluate  $\lim_{x \rightarrow -1^-} f(x)$  and  $\lim_{x \rightarrow -1^+} f(x)$  if  $f(x) = \begin{cases} \sqrt{x+5}, & x > -1 \\ x+3, & x < -1 \end{cases}$

5. Evaluate  $\lim_{x \rightarrow 4} f(x)$  and  $f(4)$  if  $f(x) = \begin{cases} e^{3x-1}, & x \leq 4 \\ x^2 + 5, & x > 4 \end{cases}$

6. Evaluate  $\lim_{x \rightarrow 0^-} f(x)$  and  $\lim_{x \rightarrow 0^+} f(x)$  if  $f(x) = \begin{cases} \frac{4x}{3-x}, & x = 0 \\ x^2 - 2, & x > 0 \\ \ln(x+1), & x < 0 \end{cases}$

7. defined, exists Evaluate  $\lim_{x \rightarrow 0^-} f(x)$  and  $\lim_{x \rightarrow 0^+} f(x)$  if  $f(x) = \begin{cases} \frac{\cos x}{x^2}, & x \geq 6 \\ 4x^2 - 1, & x < 6 \end{cases}$

8. defined, doesn't exist, Evaluate  $\lim_{x \rightarrow 9} f(x)$  and  $f(9)$  if  $f(x) = \begin{cases} |2x-1|, & x > 9 \\ \cos \frac{\pi x}{7}, & x = 9 \\ \sqrt{3x-1}, & x < 9 \end{cases}$