Calculus 1 Workbook

Continuity

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MATH

POINT DISCONTINUITIES

■ 1. Redefine the function as a continuous piecewise function.

$$f(x) = \frac{x^2 - 6x - 27}{x + 3}$$

■ 2. Identify the non-removable discontinuities of the function.

$$k(x) = \frac{x^3 + 3x^2 - 25x - 75}{x^2 + x - 12}$$

■ 3. What is the set of removable discontinuities of the function?

$$j(\theta) = \frac{\cos^2\theta \cdot \sin^2\theta}{\tan^2\theta}$$

■ 4. Examine whether or not the function is continuous at $x = 0$.

$$g(x) = \begin{cases} 2 - x^2 & x \leq 0 \\ x - 2 & x > 0 \end{cases}$$

■ 5. Where is the removable discontinuity in the graph of the function?

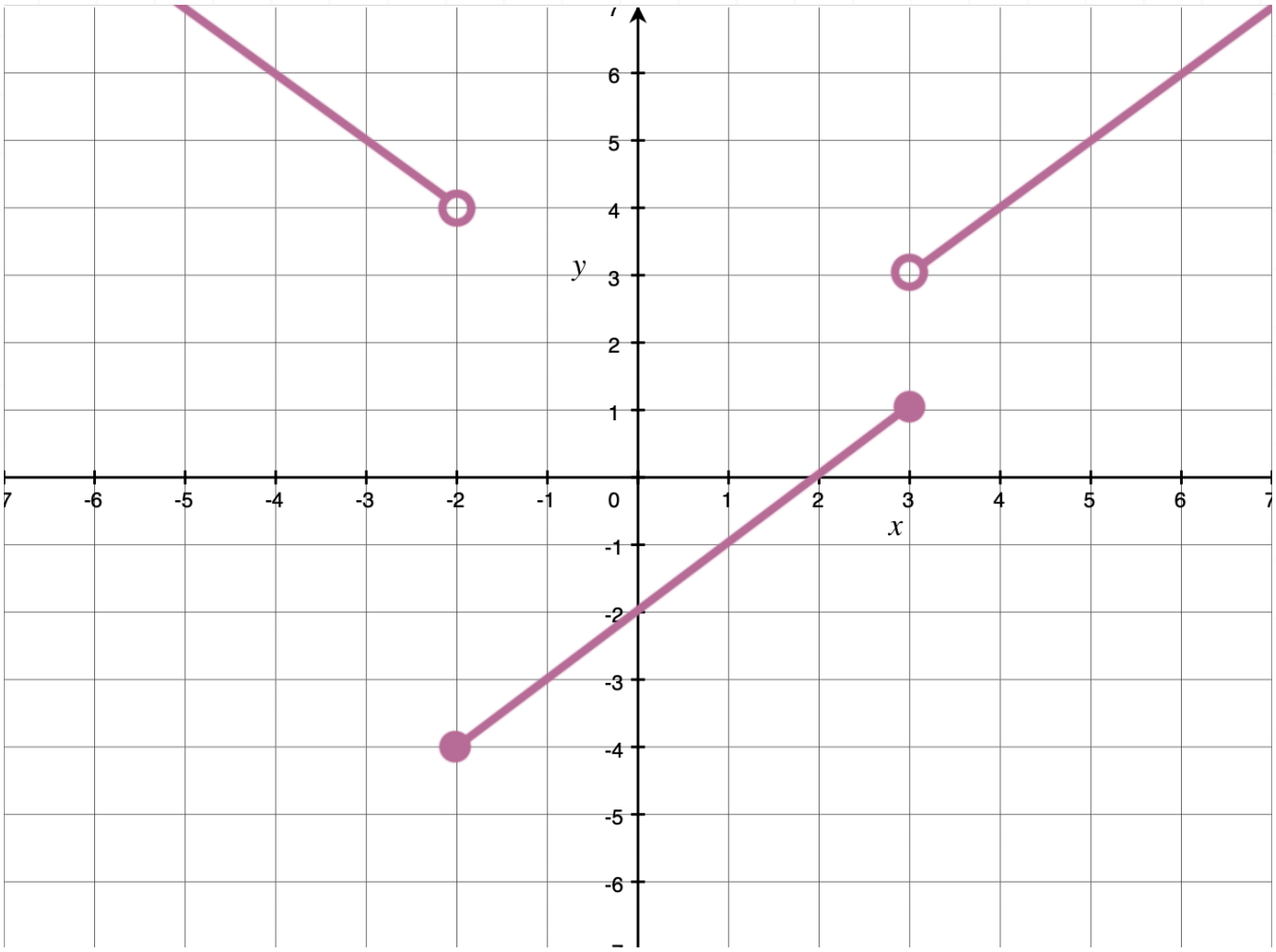
$$f(x) = \frac{x^3 + 27}{x + 3}$$

6. Identify the removable discontinuities in the function.

$$k(x) = \frac{x^4 - 2x^3 - 16x^2 + 2x + 15}{x^2 - 2x - 15}$$

JUMP DISCONTINUITIES

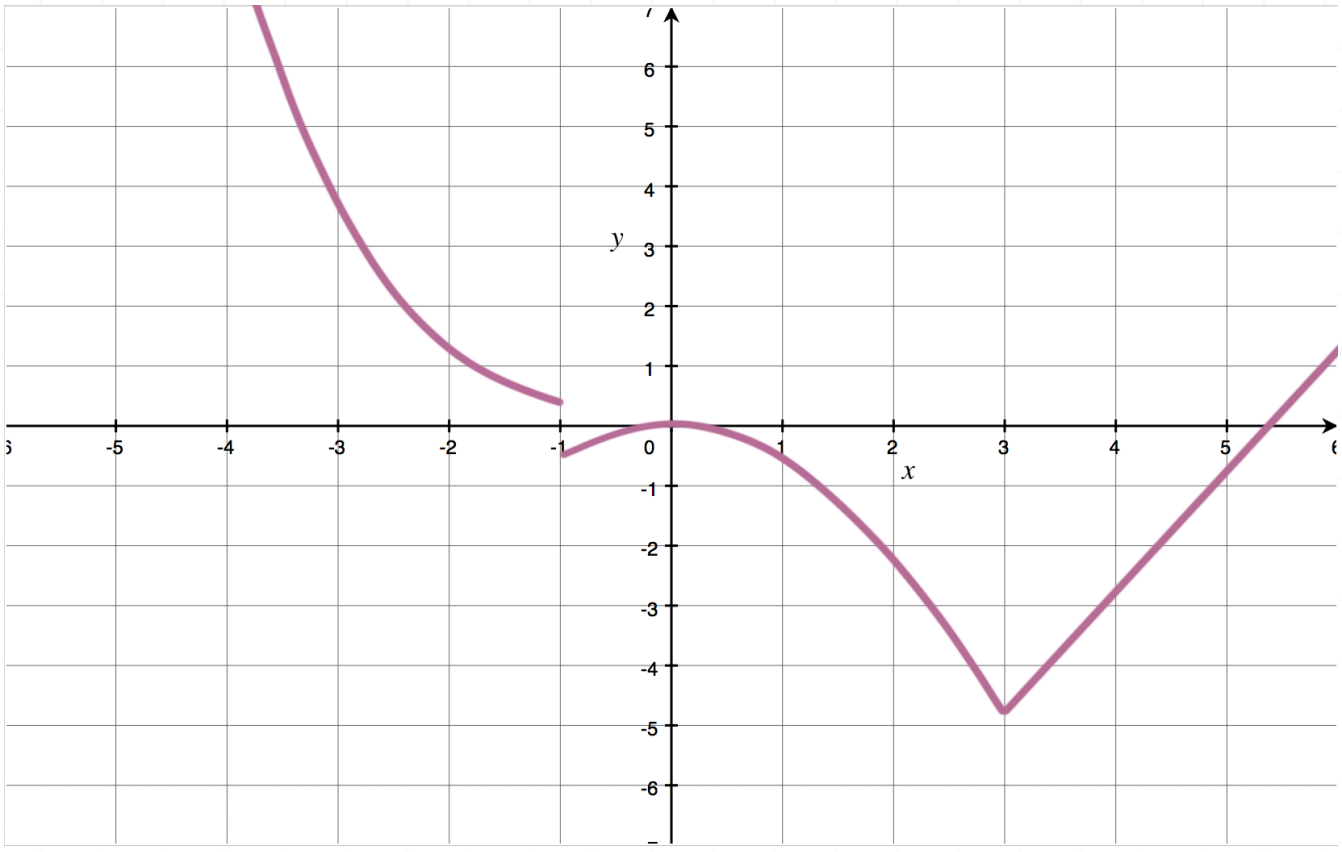
■ 1. What are the x-values where the graph of $f(x)$, shown below, has jump discontinuities?



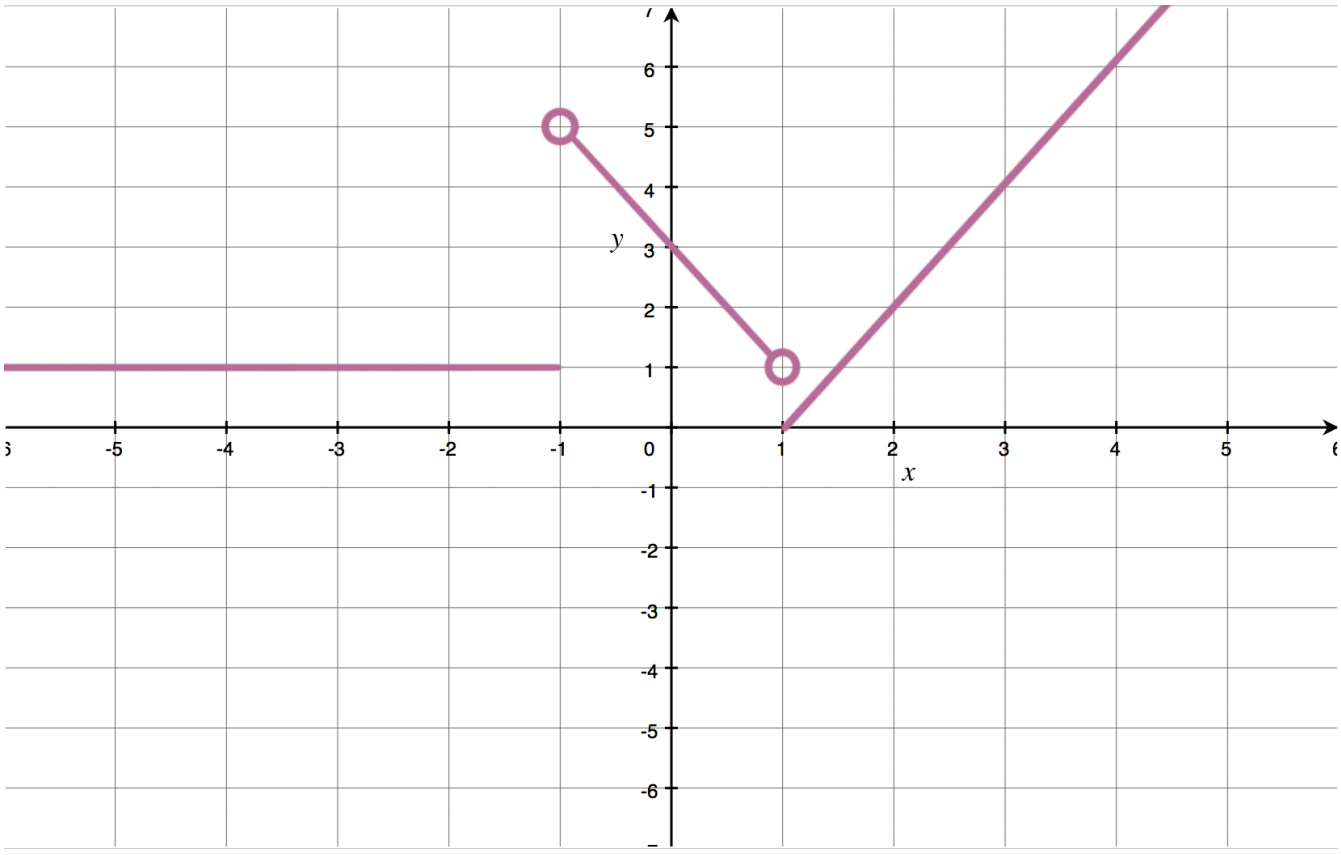
■ 2. Where are the jump discontinuities in the graph of the function?

$$h(x) = \begin{cases} -\frac{1}{3}x^2 + 2 & x < 0 \\ 3 & 0 \le x \le 1 \\ \frac{1}{3}x^2 + 4 & x > 1 \end{cases}$$

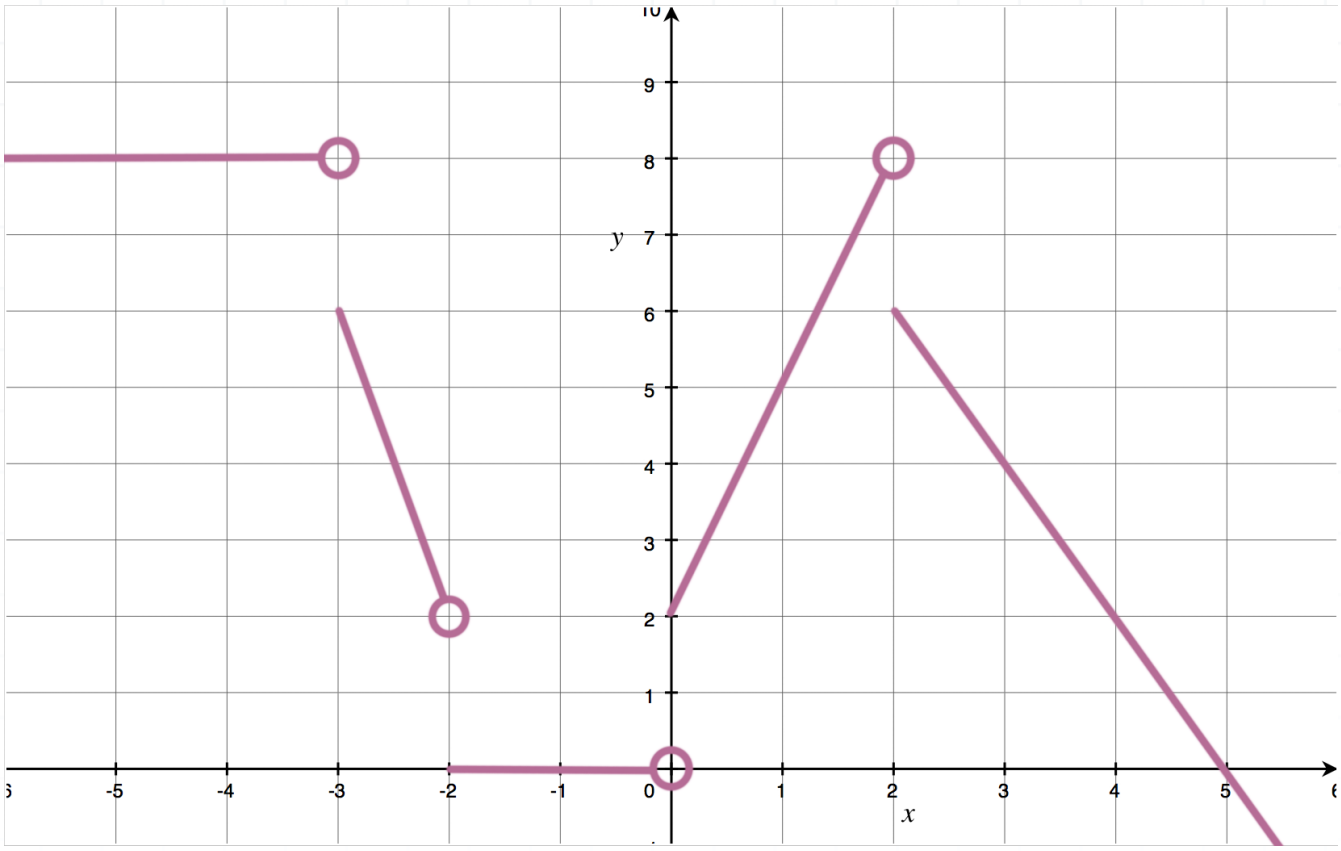
■ 3. What are the x-values where the graph of $g(x)$ has jump discontinuities?



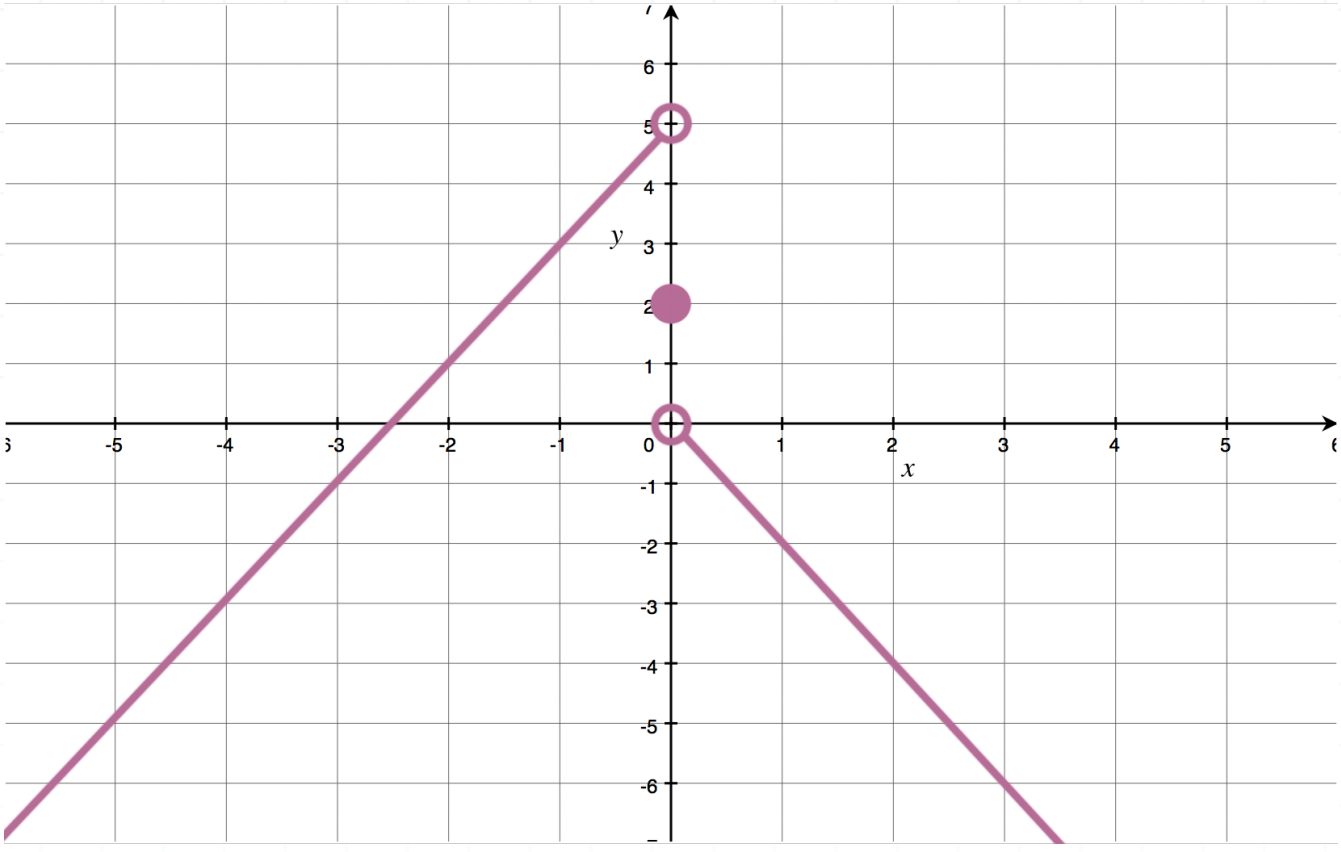
■ 4. Show that $f(x)$ has jump discontinuity at $x = -1$ and $x = 1$.



■ 5. Where are the jump discontinuities in the graph of the function shown below?



■ 6. What are the x-values where the graph of $h(x)$, shown below, has jump discontinuities?



INFINITE DISCONTINUITIES

1. At what x-values does the function have infinite discontinuities?

$$f(x) = \frac{x^2 + x - 12}{x^2 + x - 2}$$

2. Where are the infinite discontinuities of the function?

$$h(x) = \frac{x^4 + 3x^3 - 8x - 24}{x^2 + 3x - 4}$$

3. At what x-values does the function have infinite discontinuities?

$$g(x) = \frac{x^2 - 5x + 6}{x^2 - 1}$$

4. Where are the infinite discontinuities of the function?

$$h(x) = \frac{x^2 - 6x + 9}{x^2 - 4}$$

5. At what x-values does the function have infinite discontinuities?

$$h(x) = \frac{x^2 - 6x + 9}{x^2 + x - 12}$$

6. Classify the discontinuities of $f(x) = \cot x$ on the interval $[0,2\pi]$.

ENDPOINT DISCONTINUITIES

1. What is the value of the limit on the interval $[0,3]$?

$$\lim_{x\to 3} -\sqrt{x+5}$$

2. What is the value of the limit on the interval $[\pi,2\pi]$?

$$\lim_{x\to \pi} \sin x$$

3. What is the value of the limit on the interval $[4,\infty)$?

$$\lim_{x\to 4} -\frac{x+7}{x^2-6x+15}$$

4. What is the value of the limit on the interval $[-9/2,5/2]$?

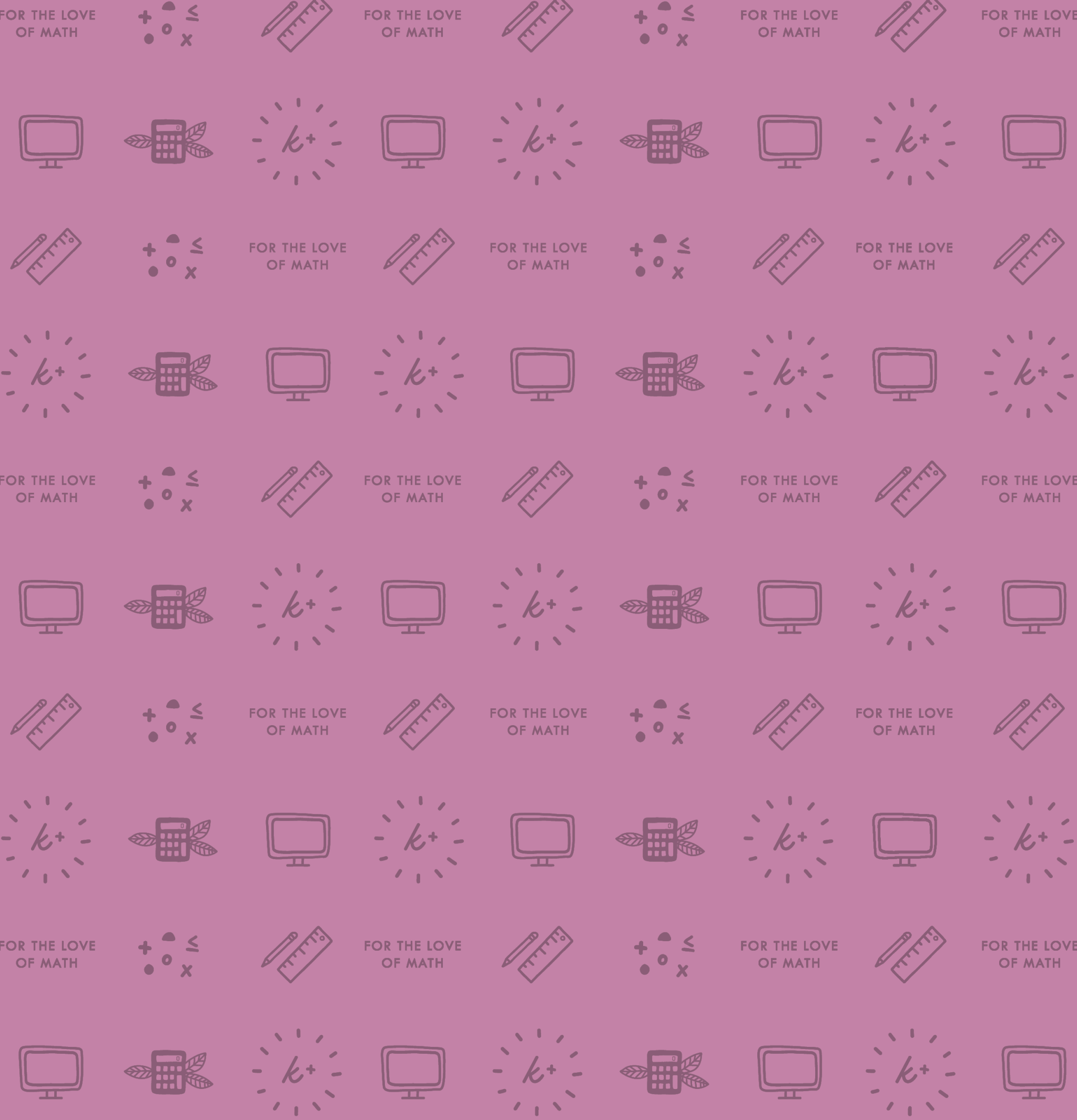
$$\lim_{x\to \frac{5}{2}} \frac{x+3}{x^2+x+1}$$

5. What is the value of the limit on the interval $(-2,2]$?

$$\lim_{x\to -2} \sqrt{2x+4}$$

6. What is the value of the limit on the interval $[-\pi, \pi]$?

$$\lim_{x \to \pi} -\frac{5\cos x}{2}$$



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