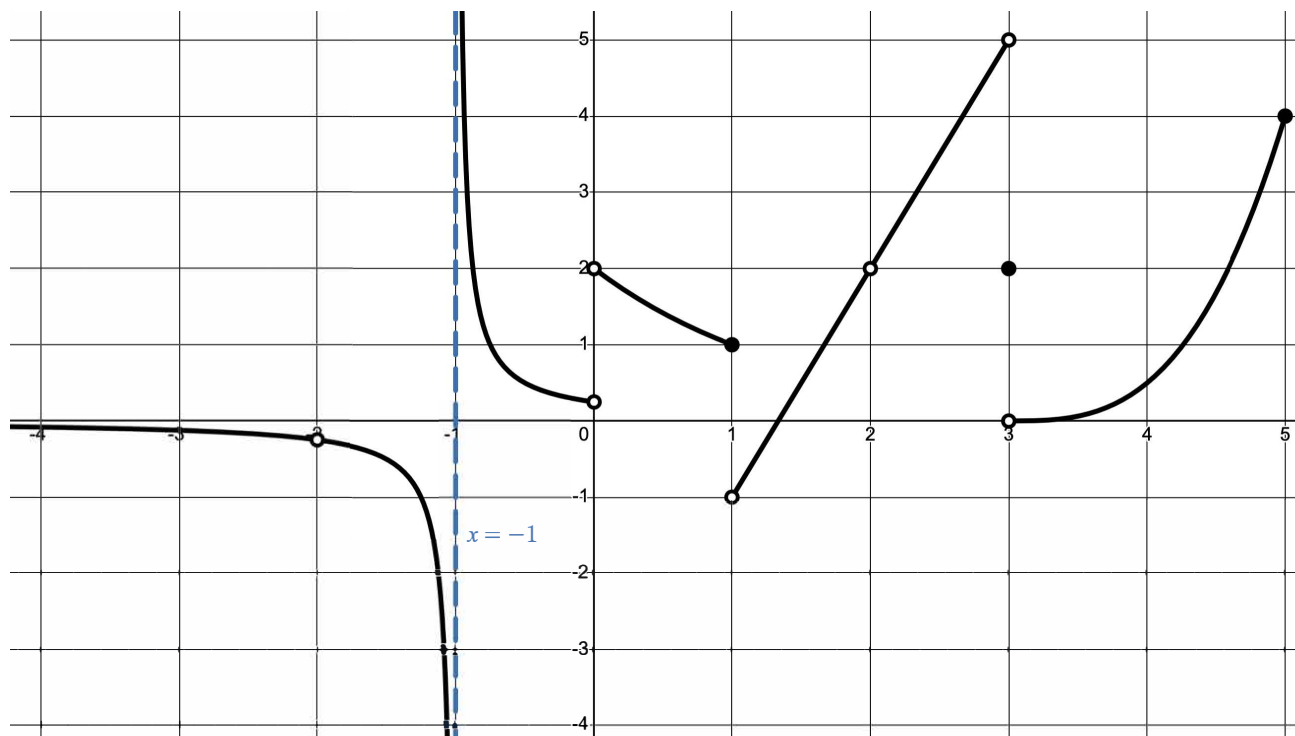


1. (18 pts) Consider the function $f(x) = \frac{x+4}{\sqrt{x}}$ and answer the following:
- (a) What is the domain of $f(x)$? Give your answer in interval notation.
 - (b) Does $f(x)$ have any horizontal asymptote(s)? To earn credit, use limit(s) to justify your answer. You may not use L'Hospital's rule or dominance of powers arguments.
 - (c) Does $f(x)$ have any vertical asymptote(s)? To earn credit, use limit(s) to justify your answer. You may not use L'Hospital's rule or dominance of powers arguments.
2. (22 pts) Evaluate the following limits (be sure to show all justification. You may not use L'Hospital's rule or dominance of powers arguments.):
- (a) $\lim_{x \rightarrow \infty} \frac{\sqrt{5+x} - \sqrt{5}}{x}$
 - (b) $\lim_{x \rightarrow 0} \frac{\sin(4x) \sin(7x)}{x^2}$
 - (c) $\lim_{x \rightarrow 8} \frac{x - 2x^{1/3}}{3x - 12}$
3. (28 points) The following problems are unrelated.
- (a) A bird, perched on a sheer cliff, spots a beetle on the flat ground 100 feet away from the base of the cliff. The bird flies straight toward the beetle, snatches it up in its beak, and then runs 8 feet along the ground to join its flock. Suppose 30° is the angle between the bird's flight path and the ground. From the time the bird took flight, how far did the bird travel before joining its flock?
 - (b) Solve the equation $\cos(2t) = -\sin^2(t)$.
 - (c) Solve the inequality $3 \cos(t) < \frac{3}{2}$ on the interval $[0, 2\pi)$.
 - (d) Sketch the graph of $g(x) = 2\sqrt{x+1}$. Be sure to label relevant intercept(s) on your graph.

4. (18 points) Using the graph of $y = f(x)$ below, compute the following. If the limit does not exist, write DNE. Justification is not required for this problem.

- (a) $\lim_{x \rightarrow -1^+} f(x)$ (b) $\lim_{x \rightarrow -1} f(x)$ (c) $\lim_{x \rightarrow 5^-} f(x)$ (d) $f(3)$
- (e) $\lim_{x \rightarrow 2} f(x)$ (f) $\lim_{x \rightarrow -\infty} f(x)$ (g) $\lim_{x \rightarrow 1} |f(x)|$ (h) $\lim_{x \rightarrow 3^-} xf(x)$



5. (14 pts) The following problems are unrelated.

- (a) Is there a value of x such that $x^2 - \sqrt{x+1} = 4\sin(\pi x)$? Be sure to justify your answer and state any theorems you use.
- (b) What value of c makes the following function continuous? Be sure to justify your answer using the definition of continuity.

$$f(x) = \begin{cases} \frac{3}{4}x|x+1|, & \text{if } x < 1 \\ c, & \text{if } x = 1 \\ \frac{1}{4}\sqrt{x+3} + 1, & \text{if } x > 1 \end{cases}$$