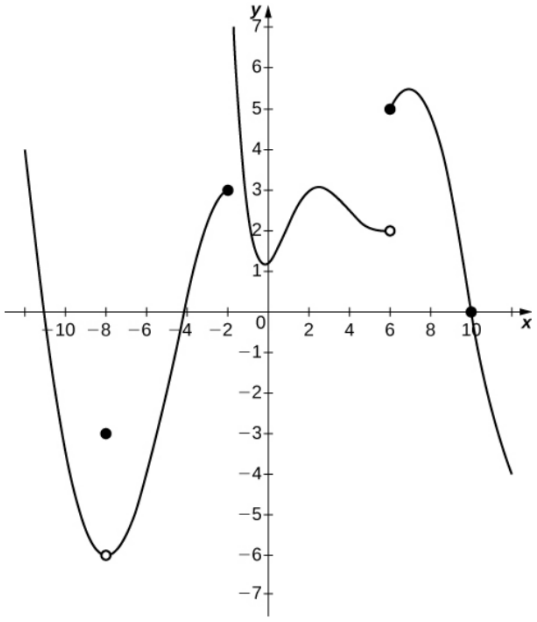
Name: _____

- Write all of your responses on these exam pages. If you need more space for your answers please use the backs of the exam pages.
- Make sure that you show all of your work, answers without supporting work will receive no credit.
- **No calculation devices are to be used on this exam.**

1. (*10 Points*) Given the graph of the the function f below, answer the following.



(a) $\lim_{x\to -8} f(x) =$ _____

(b) $f(-8) =$ _____

(c) $\lim_{x\to -2} f(x) =$ _____

(d) $\lim_{x\to -2^+} f(x) =$ _____

(e) $\lim_{x\to -2^-} f(x) =$ _____

(f) $f(-2) =$ _____

(g) $\lim_{x\to 6} f(x) =$ _____

(h) $\lim_{x\to 6^+} f(x) =$ _____

(i) $\lim_{x\to 6^-} f(x) =$ _____

(j) $f(6) =$ _____

(k) List all points of discontinuity. For each, state the type of discontinuity and state if the function is continuous from the left or right at that point.

2. (*10 Points*) Sketch the graph of an example of a function f that satisfies all of the given conditions.

(a) $\lim_{x\to -3} f(x) = 2$

(b) $f(-3) = -2$

(c) $\lim_{x\to 0^+} f(x) = 1$

(d) $\lim_{x\to 0^-} f(x) = \infty$

(e) $f(0)$ Does not exist.

(f) $\lim_{x\to 1} f(x)$ Does not exist.

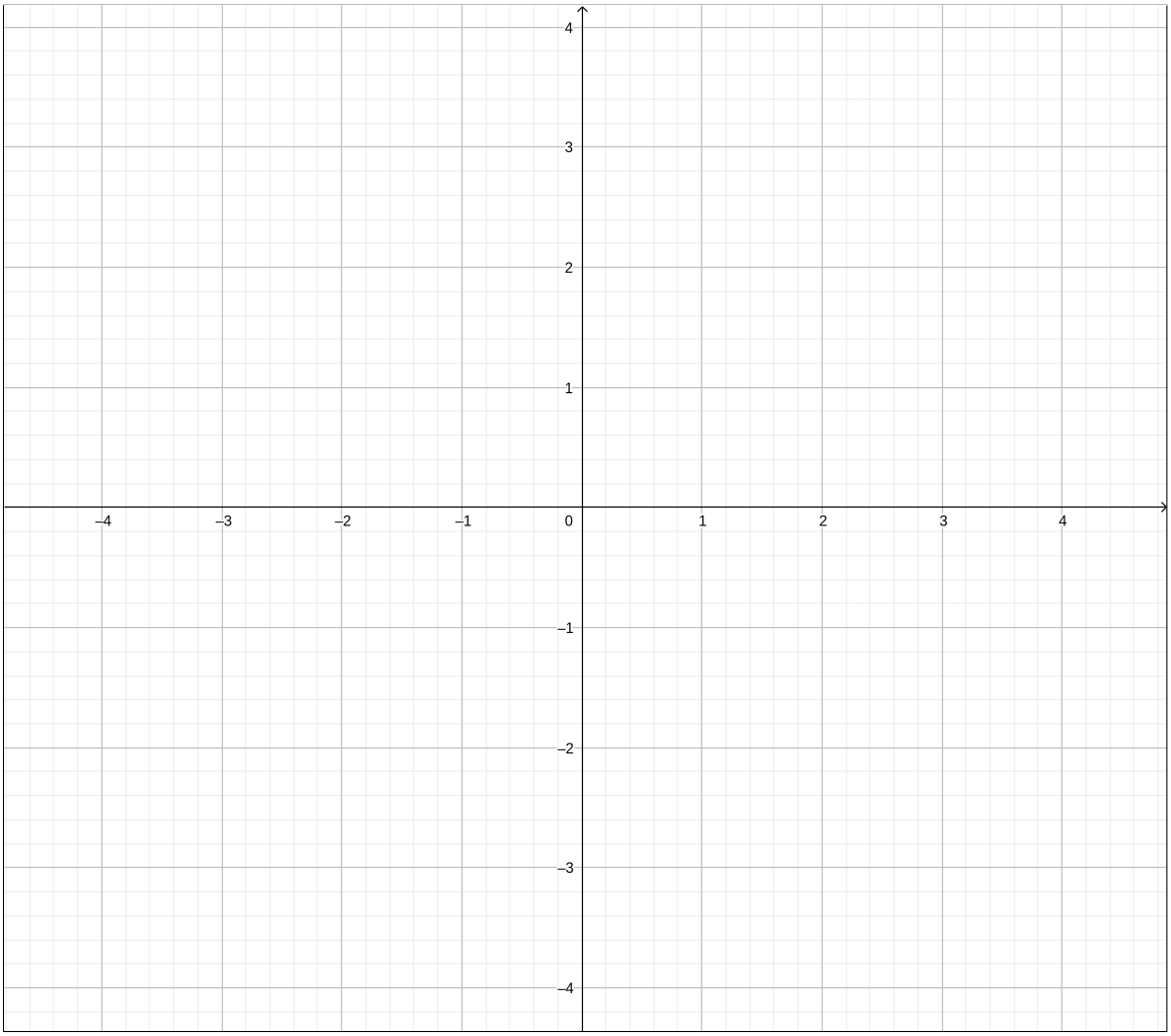
(g) $\lim_{x\to 2^+} f(x) = 4$

(h) $\lim_{x\to 2^-} f(x) = 3$

(i) $f(2) = 1$

(j) $\lim_{x\to \infty} f(x) = -2$

(k) $\lim_{x\to -\infty} f(x) = 0$



3. (*10 Points*) Find the following limit using limit laws. Keep your answer in exact form.

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

4. (*10 Points*) Find the following limit using limit laws. Keep your answer in exact form.

$$\lim_{h \to 0} \frac{(-2+h)^{-1} + 2^{-1}}{h}$$

5. (*10 Points*) Find the following limit using limit laws. Keep your answer in exact form.

$$\lim_{x\to 2} \frac{x^2 - 4x + 4}{x^4 - 3x^2 - 4}$$

6. (*10 Points*) Find the following limit using limit laws. Keep your answer in exact form.

$$\lim_{t\to 0} \left(\frac{1}{t} - \frac{1}{t^2 + t} \right)$$

7. (*10 Points*) Show that there is a solution of the equation

$$\sin(x) - \frac{1}{4} = \cos(x) + \frac{1}{4}$$

in the interval $\left(\frac{\pi}{4}, \frac{2\pi}{3}\right)$

8. (*10 Points*) Find the following limits. Keep your answers in exact form.

$$\lim_{x\to\infty} \frac{x+3}{\sqrt{2x^2-1}} \qquad \lim_{x\to-\infty} \frac{x+3}{\sqrt{2x^2-1}}$$

9. (*10 Points*) Find the following limits. Keep your answers in exact form.

$$\lim_{x\to\infty}\left(\sqrt{4x^2+3x}+2x\right) \qquad \lim_{x\to-\infty}\left(\sqrt{4x^2+3x}+2x\right)$$

10. (*10 Points*) Prove that

$$\lim_{x\to 0}\left(\sqrt{x^3+x^2}\right)\sin\left(\frac{\pi}{x}\right)=0$$