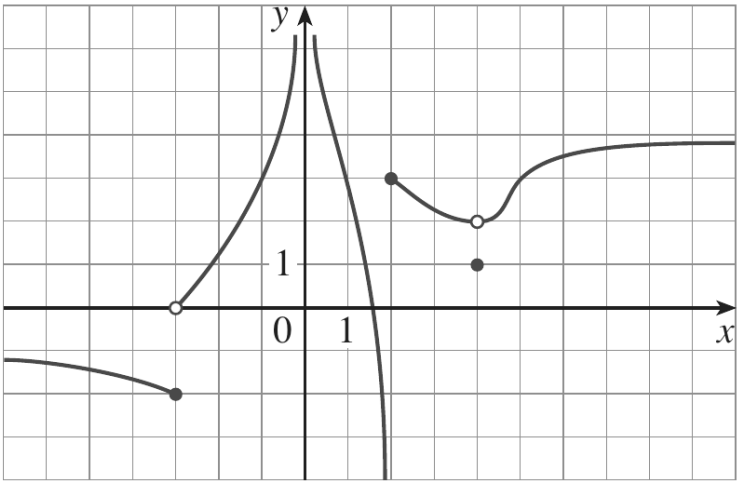
Name: _____

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

(b) $\lim_{x\to -3^-} f(x) =$ _____

(c) $\lim_{x\to -3^+} f(x) =$ _____

(d) $\lim_{x\to 0} f(x) =$ _____

(e) $f(0) =$ _____

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

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

(h) $f(2) =$ _____

(i) $\lim_{x\to 4} f(x) =$ _____

(j) $f(4) =$ _____

(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) $\lim_{x\to -2^-} f(x) = -1$

   (b) $\lim_{x\to -2^+} f(x) = 1$

   (c) $f(-2)$ Does not exist.

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

   (e) $\lim_{x\to 0^-} f(x) = -1$

   (f) $f(0) = 0$

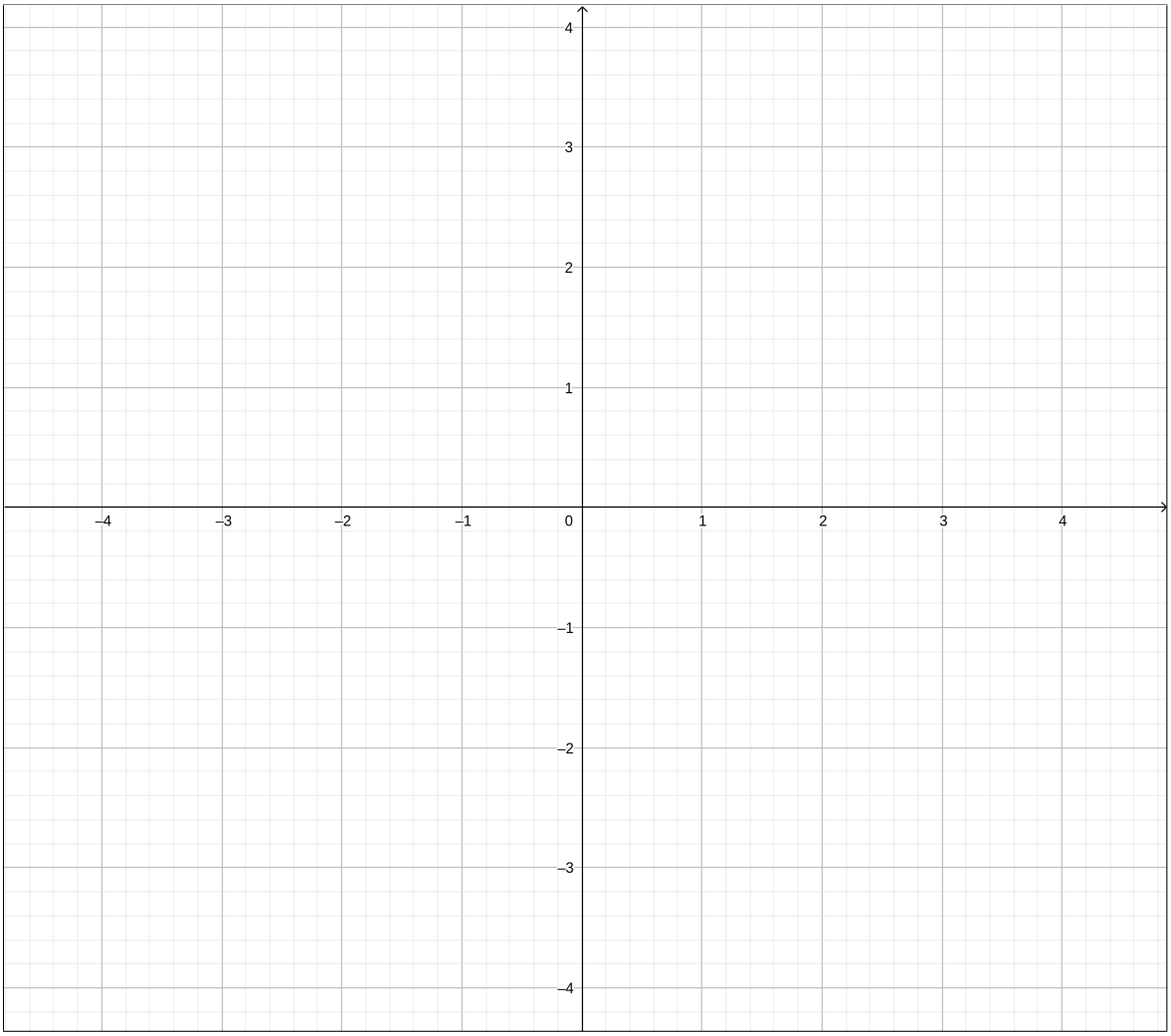
   (g) $\lim_{x\to 1^-} f(x)$ Does not exist & not infinite.

   (h) $\lim_{x\to 1^+} f(x) = -1$

   (i) $f(1) = 1$

   (j) $\lim_{x\to \infty} f(x) = 1$

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



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

$$\lim_{x\to 3} \frac{x^3 - 27}{x^2 - 9}$$

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

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

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

$$\lim_{x\to 0} \frac{\sqrt{1+x}-\sqrt{1-x}}{x}$$

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

$$\lim_{x\to -5} \frac{2x^2+9x-5}{x^2-25}$$

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

$$\tan(x) = \sin(x) + \frac{1}{2}$$

in the interval $\left(\frac{\pi}{6}, \frac{\pi}{3}\right)$

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

$$\lim_{x\to\infty} \frac{\sqrt{1+4x^6}}{2-x^3} \qquad \lim_{x\to-\infty} \frac{\sqrt{1+4x^6}}{2-x^3}$$

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

$$\lim_{x\to\infty}\left(\sqrt{25x^2+2}-5x\right) \qquad \lim_{x\to-\infty}\left(\sqrt{25x^2+2}-5x\right)$$

10. (*10 Points*) Prove that

$$\lim_{x\to 0} x^4\cos\left(\frac{2}{x}\right)=0$$