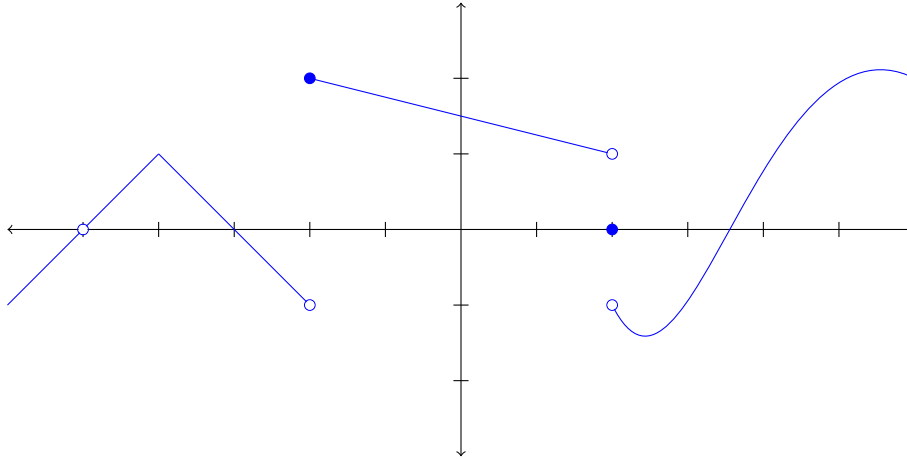Each problem is worth 10 points. For full credit provide good justification for your answers.

Use the graph of $f(x)$ for problems 1 and 2:

1. (a) What is $\lim\limits_{x \to 2^+} f(x)$?

    (b) What is $\lim\limits_{x \to 2^-} f(x)$?

    (c) What is $\lim\limits_{x \to 2} f(x)$?

    (d) What is $\lim\limits_{x \to -2^+} f(x)$?

    (e) What is $\lim\limits_{x \to -2^-} f(x)$?

2. For which values of x does the function fail to be continuous?

3. Evaluate $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x - 3}$.

4. Use the following table of values for $f(x)$ and $g(x)$ to find values for the following:

x	1	2	3	4	5	6
$f(x)$	6	3	5	1	4	2
$g(x)$	6	1	2	3	4	5

(a) $f(2)$

(b) $f(g(3))$

(c) $g(f(3))$

(d) $(f \circ g)(5)$

(e) $(g \circ f)(5)$

5. Let $f(x) = \frac{\sin x}{x}$. **Make sure your calculator is in radian mode.** Give answers accurate to at least 8 decimal places.

(a) What is $f(0.2)$?

(b) What is $f(0.1)$?

(c) What is $f(0.01)$?

(d) What is $f(0.001)$?

(e) What is $\lim\limits_{x \to 0} f(x)$?

6. For what value(s) of c is $h(x) = \begin{cases} x & \text{if } x < 3 \\ c & \text{if } x \geq 3 \end{cases}$ continuous?

7. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Crap. Calc is totally killing me. I thought I knew it all from high school, but now there's all this limit crap and you can't just put it in your calculator once, they say you gotta try a bunch of things. So like, I tried 3.9 and 3.99 for approaching 4 on this quiz, and it was getting super close to 0, like it was 0.03 then 0.003, right? So I said the limit was 0, but they said I needed to try more. How the eff many more?"

Help Biff by explaining as clearly as you can what else he really should have checked, and why.

8. Over the first few seconds after a chunk of frozen urine falls off the vent of a Russian surveilance plane flying over Ukraine, the height (in feet) of the chunk is given by the function $h(t) = 30,000 - 16t^2$. What is the chunk's average velocity over the time period beginning when $t = 3$ and lasting

   (a) 0.5 seconds

   (b) 0.1 seconds

   (c) 0.01 seconds

9. Given the function $f(x) = \frac{1}{2x}$, simplify $\frac{f(a+h)-f(a)}{h}$.

10. Evaluate $\displaystyle\lim_{x \to \infty} \left(\sqrt{x^2 + ax} - \sqrt{x^2 + bx} \right).$

Extra Credit (5 points possible): Evaluate $\lim\limits_{h \to 0} \dfrac{(x+h)^{1/3} - x^{1/3}}{h}$.