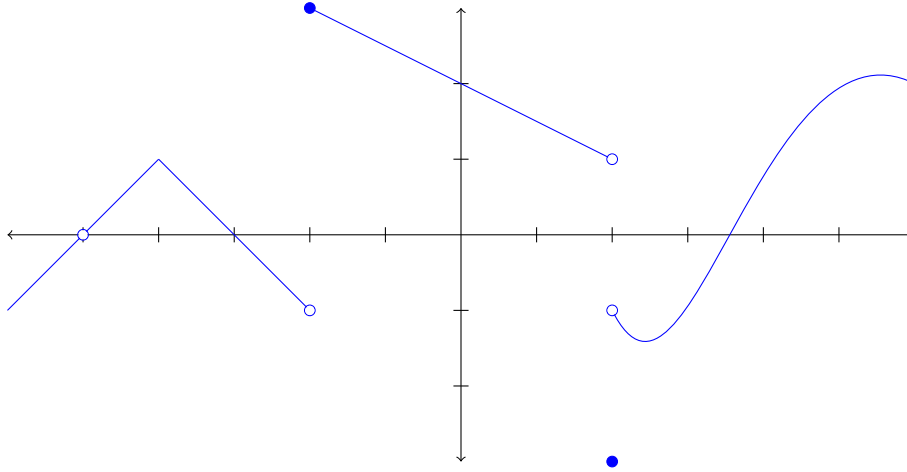


Each problem is worth 10 points. For full credit provide good justification for your answers.

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



1. (a) What is  $\lim_{x \rightarrow 2^+} f(x)$ ?
- (b) What is  $\lim_{x \rightarrow 2^-} f(x)$ ?
- (c) What is  $\lim_{x \rightarrow 2} f(x)$ ?
- (d) What is  $\lim_{x \rightarrow -2^+} f(x)$ ?
- (e) What is  $\lim_{x \rightarrow -2^-} f(x)$ ?

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

3. Evaluate  $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$ .

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

(a)  $f(2)$

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

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

(d)  $(f \circ g)(1)$

(e)  $(g \circ f)(1)$

5. Let  $f(x) = \frac{\tan x}{x}$ . **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  $\lim_{x \rightarrow 0} f(x)$ ?

6. Evaluate the following limits:

(a)  $\lim_{x \rightarrow \infty} \frac{9}{e^x - 7}$

(b)  $\lim_{x \rightarrow -\infty} \frac{9}{e^x - 7}$

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 every answer I got was negative, right, so you know whatever the limit is it has to be negative. But this girl next to me said it was zero, but that can't be, right, since negatives never get to zero!"

Help Biff by explaining as clearly as you can whether the limit he's trying to find could be zero.

8. Over the first few seconds after a chunk of frozen urine falls off the vent of a Russian surveillance 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  $t = 2.5$  and lasting

(a) 0.5 seconds

(b) 0.1 seconds

(c) 0.01 seconds

9. Given the function  $f(x) = x^3$ , simplify  $\frac{f(a+h)-f(a)}{h}$ .

10. (a) Evaluate  $\lim_{x \rightarrow 25} \frac{5 - \sqrt{x}}{25x - x^2}$ .

(b) For what value(s) of  $a$  will  $\lim_{x \rightarrow a^2} \frac{a - \sqrt{x}}{a^2x - x^2}$  be  $1/100$ ?

Extra Credit (5 points possible): Evaluate  $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^x}{h}$ .