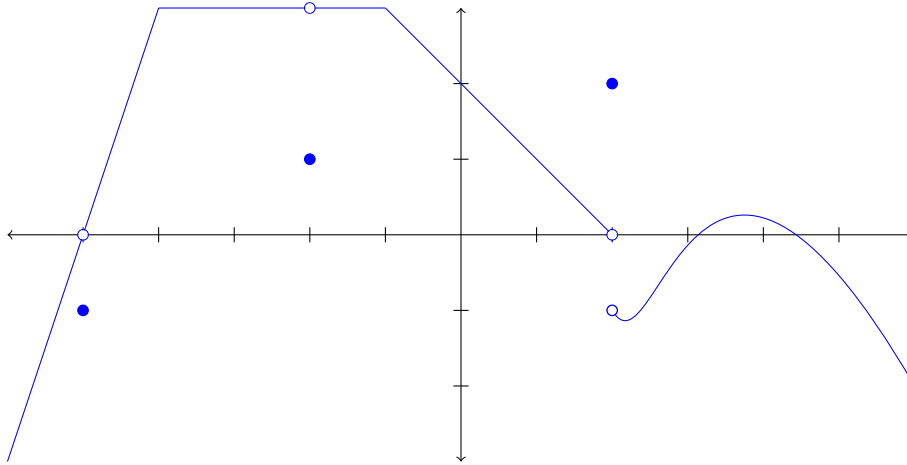


Each problem is worth 10 points. For full credit provide good justification for your answers.

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  $\lim_{x \rightarrow -5^+} f(x)$ ?
- (e) What is  $\lim_{x \rightarrow -5^-} f(x)$ ?
- (f) What is  $\lim_{x \rightarrow -5} f(x)$ ?

2. Use interval notation to indicate where the function above is continuous.

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

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
$f(x)$	9	7	4	5	6	1
$g(x)$	1	8	2	6	5	4

(a)  $f(5)$

(b)  $f(2) - 1$

(c)  $f(2 - 1)$

(d)  $(f \circ g)(3)$

(e)  $(g \circ f)(3)$

5. (a) Evaluate  $\lim_{x \rightarrow \infty} \frac{x-1}{3-x}$ .

(b) Evaluate  $\lim_{x \rightarrow 3^-} \frac{x-1}{3-x}$ .

(c) Evaluate  $\lim_{x \rightarrow 3^+} \frac{x-1}{3-x}$ .

6. [Stewart 1.3] If a ball is thrown into the air with a velocity of 40 ft/s, its height in feet  $t$  seconds later is given by  $f(t) = 40t - 16t^2$ . Find the average velocity for the time period beginning when  $t = 2$  and lasting

(a) 0.5 second

(b) 0.1 second

7. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Whoa, Calc is kicking my butt! I can plug numbers into functions, you know? But now there's this limit stuff and it's totally confusing because somehow it's not about just plugging one number in. So the professor, he made this big deal about, like, a picture of a cat, right? He said you can't tell how fast the cat is going if you just have a picture of it. I think you can if your camera is good enough, which is why I need to get one of the new iPhones, right? But the professor says definitely you can't tell how fast from just one picture. What's up with that?"

Help Biff by explaining, in terms he can understand, either how to tell from a good enough picture how fast the cat is moving, or why you're sure it isn't possible.

8. Evaluate  $\lim_{x \rightarrow \infty} (\sqrt{9x^2 + x} - 3x)$

9. Let  $f(t) = 40t - 16t^2$ . Evaluate  $\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2}$ .

10. Evaluate  $\lim_{x \rightarrow 0} \frac{|x|}{x}$ .

Extra Credit (5 points possible):

Find an equation for every line that passes through the point  $(1,1)$  but only touches the curve  $y = x^2$  at the point  $(1,1)$  alone.