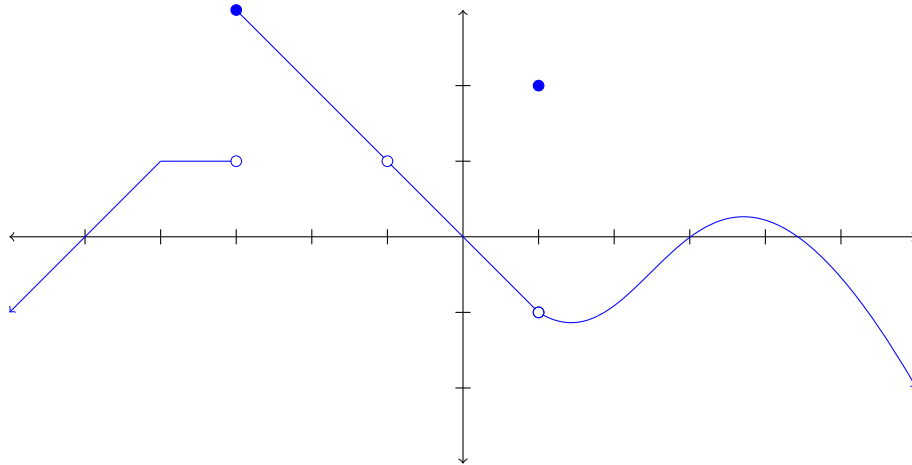


Each problem is worth 10 points. For full credit provide good justification for your answers.

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



1. (a) What is $\lim_{x \rightarrow -3^-} f(x)$?

(b) What is $\lim_{x \rightarrow -3^+} f(x)$?

(c) What is $\lim_{x \rightarrow -3} f(x)$?

(d) What is $\lim_{x \rightarrow -1^-} f(x)$?

(e) What is $\lim_{x \rightarrow -1^+} f(x)$?

(f) What is $\lim_{x \rightarrow -1} f(x)$?

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

3. Evaluate $\lim_{x \rightarrow 7} \frac{x^2 - 49}{x - 7}$.

4. The following table of values for $p(t)$ gives the position (in feet beyond the point where the car was at time 0) of a car t seconds after the driver hits the brakes because they saw a glowing purple giraffe.

t	$p(t)$
0.0	0
0.25	14
0.5	26
0.75	37
1.0	45

(a) What is the car's average velocity over the period from $t = 0.0$ to $t = 0.5$?

(b) What is the car's average velocity over the period from $t = 0.0$ to $t = 0.25$?

5. Let $f(x) = \frac{\sin 3x}{x}$. **Make sure your calculator is in radian mode.**

(a) Evaluate $f(0.1)$.

(b) Evaluate $f(0.01)$.

(c) Evaluate $f(-0.1)$.

(d) Evaluate $f(-0.01)$.

(e) What's $\lim_{x \rightarrow 0} f(x)$?

6. [WeBWorK] A ball is thrown into the air by a baby alien on a planet in the system of Alpha Centauri with a velocity of 30 ft/s. Its height in feet after t seconds is given by $h(t) = 30t - 27t^2$. Find the average velocity for the time period beginning when $t_0 = 0.5$ seconds and lasting for 0.1 seconds.

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. Like, the professor was saying that for this function the limit when x was 2 didn't exist, and what about f of 2. I said it must not exist too, but this other person in the class said it could. Isn't that mixed up?"

Help Biff by explaining, in terms he can understand, what can be concluded about $f(2)$ from the information given.

8. Consider the function defined by

$$g(x) = \begin{cases} 3x^2 - 2, & x \leq 1 \\ 5 - 4x, & x > 1 \end{cases}$$

Is $g(x)$ continuous at $x = 1$? Explain clearly why or why not.

9. Evaluate $\lim_{h \rightarrow 0} \frac{(a+h)^2 - a^2}{h}$.

10. Evaluate $\lim_{x \rightarrow 2} \frac{|x - 2|}{|x - 4| - x}$. Be sure to include clear justification.

Extra Credit (5 points possible):

Find an equation for a line that passes through the point $(2, 2)$ and touches the graph of the circle $x^2 + y^2 = 1$ exactly once.