

**Exam 1 Calc 1 9/10/2021**

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

Use the graph of  $g(x)$  at the bottom of the page for problems 1 and 2:

1. Find the following limits:

a)  $\lim_{x \rightarrow 3^-} g(x)$

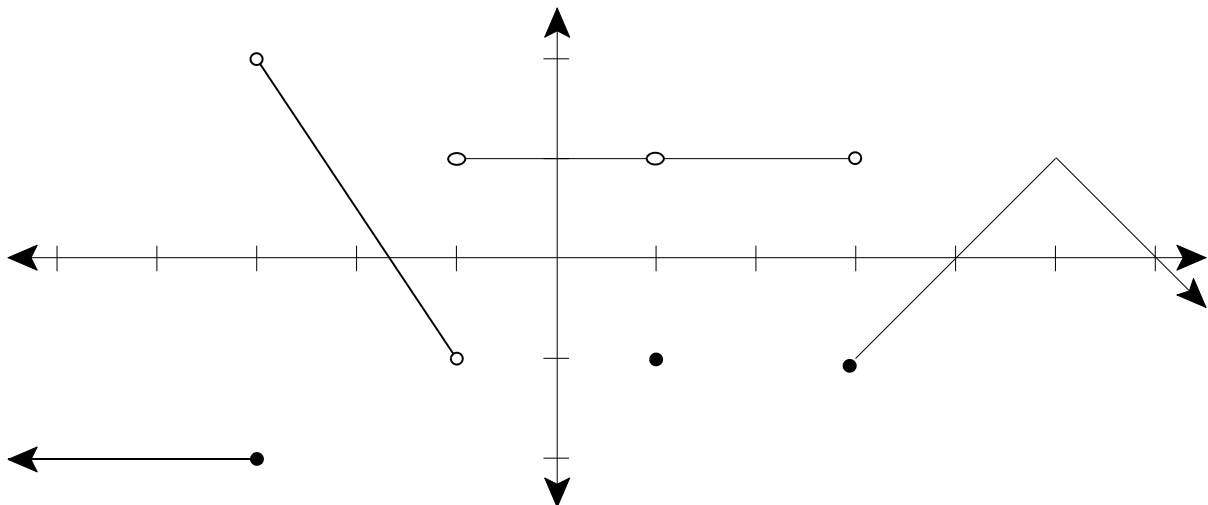
b)  $\lim_{x \rightarrow 3^+} g(x)$

c)  $\lim_{x \rightarrow 3} g(x)$

d)  $\lim_{x \rightarrow 1^+} g(x)$

e)  $\lim_{x \rightarrow 1^-} g(x)$

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



3. Use the table to evaluate the following expressions.

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

a)  $f(2)$

b)  $f(g(1))$

c)  $g(f(1))$

d)  $f \circ g(3)$

e)  $g \circ f(3)$

4. Consider the function  $f(x) = \begin{cases} 1 & \text{for } x > 0 \\ 0 & \text{for } x \leq 0 \end{cases}$ . What is  $\lim_{x \rightarrow 0} f(x)$ , and why?

5. Find the limits:

a)  $\lim_{x \rightarrow 5^+} \frac{x^2 - 25}{x - 5}$

b)  $\lim_{x \rightarrow 5^-} \frac{x^2 - 25}{x - 5}$

6. Evaluate  $\lim_{x \rightarrow \infty} \frac{x^2 + 5}{2x^3 + 1}$ .

7. Jordan is a calculus student at Enormous State University, and there's some trouble. Jordan says "Wow. We had to do this group assignment in Calc today and it got kind of out of control. My group had these two people, Biff and Bunny, and they really just couldn't agree on anything. We were doing one of those average velocity things, you know, like with really smaller and smaller intervals? And Biff got positive average velocity every time he tried, but Bunny got negative every time she tried. I doublechecked them, and we even got one of the TAs to check, and they said the calculation stuff was all right. The TA said this cryptic thing, like about close to positive and negative both. How could that even be?"

Help Jordan by explaining as clearly as you can what the limit must have been, and why.

8. A bear drops a watermelon from a tall tree, hoping to scare away a vicious cat. The height of the watermelon  $t$  seconds after being dropped is given by  $h(t) = -16t^2 + 36$  for values of  $t$  between 0 and 1.5.

Give answers accurate to at least 4 digits.

a) Find the average velocity of the watermelon over the interval  $[1, 1.5]$ .

b) Find the average velocity of the watermelon over the interval  $[1.4, 1.5]$ .

c) Find the average velocity of the watermelon over the interval  $[1.49, 1.5]$ .

9. Let  $f(x) = 5 - 4x - x^2$ . Evaluate the difference quotient  $\frac{f(3+h) - f(3)}{h}$ .

10. Let  $f(x) = mx + b$ . Evaluate the difference quotient  $\frac{f(3+h) - f(3)}{h}$ .

Extra Credit (5 points possible):

Evaluate  $\lim_{t \rightarrow \infty} \frac{7 + 5e^t + 0.23e^{2t}}{3e^{2t} + 2}$