

Exam 1 Calc 1 9/14/2020

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

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

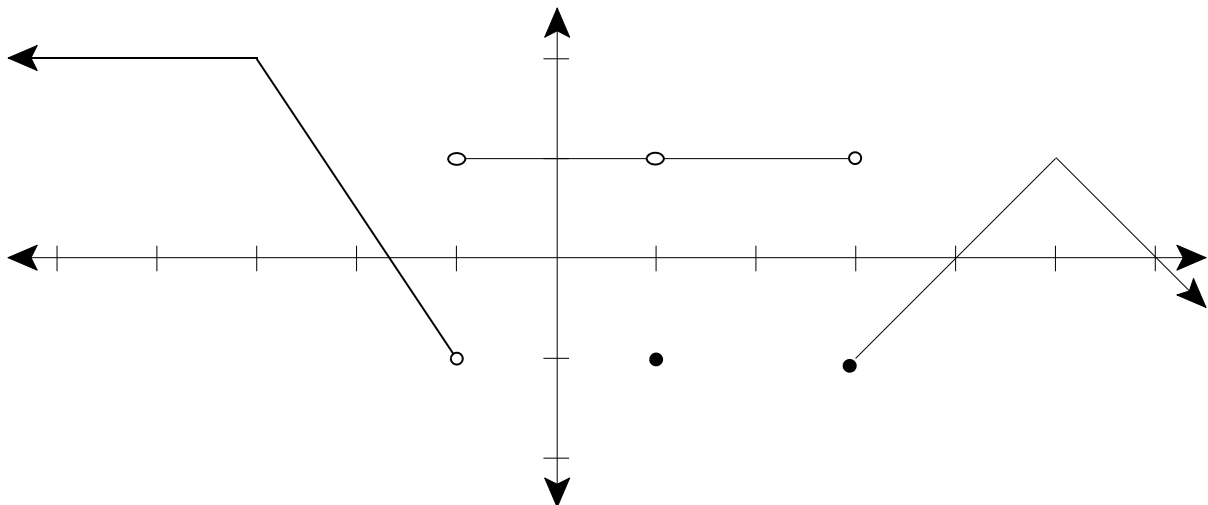
c) $\lim_{x \rightarrow -1} g(x)$

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

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

f) $\lim_{x \rightarrow 1} g(x)$

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



3. Evaluate $\lim_{x \rightarrow 2} \frac{(x-2)(x-1)}{x-2}$.

4. Let $f(x) = \frac{\cos x - 1}{x}$. **Make sure your calculator is in radian mode.** Give answers accurate to at least 8 decimal places.

a) What is $f(0.1)$?

b) What is $f(0.01)$?

c) What is $f(0.001)$?

d) What is $\lim_{x \rightarrow 0^+} f(x)$?

5. Find the limits:

a) $\lim_{x \rightarrow -3^+} \frac{x+2}{x+3}$

b) $\lim_{x \rightarrow -3^-} \frac{x+2}{x+3}$

6. Evaluate $\lim_{x \rightarrow \infty} \frac{6x^3 - 9x^2 - 6x}{11 - 5x - 2x^3}$.

7. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Well, crap. Calc is totally killing me. I thought it would be easy because I've got a cool graphing calculator, right? But I guess it's broken or something. There was this question on our test where the professor said it's not continuous, like there's a hole, but when I graphed $x^2 - 4$ over $x - 2$, it totally shows no hole. So I'm pretty sure the professor is an idiot, because the calculator definitely knows how to graph, right?"

Help Biff by explaining as clearly as you can whether there's a hole in his function, where, and why.

8. An extremely shiny stainless steel cylinder falls toward the surface of Mars after an engine malfunction shortly before planned landing so that the height of the cylinder above ground level is given by $h(t) = -1.86t^2 + 7.44$ for values of t between 0 and 2.

Give answers accurate to at least 8 decimal places.

- a) Find the average velocity of the cylinder over the interval $[1.5, 2]$.

- b) Find the average velocity of the cylinder over the interval $[1.9, 2]$.

- c) Find the average velocity of the cylinder over the interval $[1.99, 2]$.

- d) Estimate the cylinder's instantaneous velocity at $t = 2$.

9. For the function $f(x) = \frac{(x-3)(x+1)}{|x-3|}$, evaluate the following limits and explain your reasoning clearly:

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

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

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

10. A function of the form $f(x) = \begin{cases} 0 & \text{for } x \leq 0 \\ 0.1x & \text{for } 0 < x \leq 1 \\ c & \text{for } 1 < x \leq 2 \\ -0.1x + 0.3 & \text{for } 2 < x \leq 3 \\ 0 & \text{for } 3 < x \end{cases}$ is meant to be continuous.

What value does c need to have, and why?

Extra Credit (5 points possible):

What is the total area between the function in #10 and the x -axis?