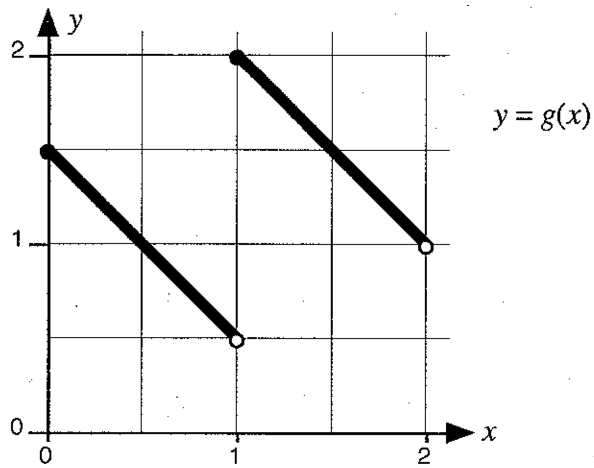
SOLUTIONS

Quiz #3

1. In this problem, the function $g(x)$ will always refer to the function defined by the following graph.



For each of the quantities listed below, state the value of the quantity if it exits. If you believe that any of the quantities listed below does *not* exist, briefly (1-2 sentences) explain why not.

(a) **(1 point)** $\lim_{x \to 1^+} g(x) = 2$

(b) **(1 point)** $\lim_{x \to 1^-} g(x) = \frac{1}{2}$

(c) **(1 point)** $\lim_{x \to 1} g(x)$ does not exist.

This is because $\lim_{x \to 1^+} g(x) \neq \lim_{x \to 1^-} g(x)$.

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2. In this problem, the function $k(x)$ will always refer to the function defined by the formula:

$$k(x) = \frac{\tan(2x)}{\tan(3x)}.$$

(a) **(1 point)** Is $x = 0$ in the domain of $k(x)$? Briefly explain how you know.

No $x = 0$ is not in the domain of $k(x)$.

This is because $\tan(3 * 0) = \tan(0) = 0$.

(b) **(2 points)** Use your calculator to complete all entries in both of the tables shown below. Give your answers correct to at least four decimal places.

x	0.01	0.001	0.0001	0.00001
k(x)	0.6665	0.6666	0.6666	0.6666

x	-0.00001	-0.0001	-0.001	-0.01
k(x)	0.6666	0.6666	0.6666	0.6665

(c) **(2 points)** Do the entries in the Tables in Part (b) provide evidence to suggest that:

$$\lim_{x \to 0} k(x)$$

exists or evidence to suggest that this limit does not exist? Briefly explain how you know.

The entries in the table suggest that $\lim_{x \to 0} k(x)$ exists.

This is because as x approaches zero from above ($x \to 0^+$), $k(x)$ appears to approach $2/3$. When x approaches zero from below ($x \to 0^-$), $k(x)$ appears to approach $2/3$, which is the same value that $k(x)$ appears to approach as $x \to 0^+$.

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3. Explain when asked and show your work.

(a) **(1 point)** Briefly explain what is wrong with the following equation:

$$\underbrace{\frac{x^2+3x-10}{x-2}}_{\text{left hand side}} = \underbrace{x+5}_{\text{right hand side}}.$$

The equation should hold for every single value of x. However, when $x = 2$, the left hand side of the equation is not defined. When $x=2$, the right hand side of the equation is defined and equal to 7.

(b) **(1 point)** Calculate the value of the limit: $\lim_{x \to 0} \frac{x^2+3x-10}{x-2}$.

$$\lim_{x \to 0} \frac{x^2+3x-10}{x-2} = \lim_{x \to 0} x+5 = 7.$$