

MATH 101
QUIZ # 2

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Q1. Let

$$f(x) = \begin{cases} 3x^2 - x, & \text{for } x < 2 \\ 10 & \text{for } x = 2 \\ 28 - 9x & \text{for } x > 2. \end{cases}$$

Is f continuous at $x = 2$? **Why?**

Yes, because:

1. $f(x)$ is defined at $x = 2$ where $f(2) = 10$
 2. $\lim_{x \rightarrow 2^-} 3x^2 - x = 10$
 $\lim_{x \rightarrow 2^+} 28 - 9x = 10$
 $\Rightarrow \lim_{x \rightarrow 2} f(x)$ exists and $= 10$
 3. $\lim_{x \rightarrow 2} f(x) = f(2) = 10$
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Q2. Let

$$f(x) = \frac{x^2 - 4}{x - 2}, \text{ then } \lim_{x \rightarrow 2} f(x) = 4.$$

If $\epsilon = 0.05$, find a number δ such that:

$$\begin{aligned} |f(x) - 4| < \epsilon & \text{ if } 0 < |x - 2| < \delta \\ \left| \frac{x^2 - 4}{x - 2} - 4 \right| < 0.05 & \text{ if } 0 < |x - 2| < \delta \\ |x + 2 - 4| < 0.05 & \text{ if } 0 < |x - 2| < \delta \\ |x - 2| < 0.05 & \text{ if } 0 < |x - 2| < \delta \end{aligned}$$

then we may pick $\delta = \epsilon = 0.05$