



Quiz 3

Print Name: _____

Sign: _____

Compute each of the following limits. Show all your work.

1. $\lim_{x \rightarrow 0} \frac{x^2 - 4}{x^2 - 3x + 2}$

limit laws apply without exception since the denominator is not zero at $x = 0$.

$$\lim_{x \rightarrow 0} \frac{x^2 - 4}{x^2 - 3x + 2} = \frac{-4}{2} = -2$$

2. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 - 3x + 2}$

Denominator is zero at $x = 2$, so try to factor and cancel before applying limit rules:

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 - 3x + 2} = \lim_{x \rightarrow 2} \frac{(x - 2)(x + 1)}{(x - 2)(x - 1)} = \lim_{x \rightarrow 2} \frac{(x + 1)}{(x - 1)} = \frac{(2 + 1)}{(2 - 1)} = 3$$

3. $\lim_{x \rightarrow \infty} \frac{x^2 - 4}{x^2 - 3x + 2}$

$$\lim_{x \rightarrow \infty} \frac{x^2 - 4}{x^2 - 3x + 2} = \lim_{x \rightarrow \infty} \frac{x^2(1 - 4/x^2)}{x^2(1 - 3/x + 2/x^2)} = \lim_{x \rightarrow \infty} \frac{1 - 4/x^2}{1 - 3/x + 2/x^2} = \frac{1 - 0}{1 - 0 + 0} = 1$$

4. $\lim_{x \rightarrow (\pi/4)^+} \frac{\sin(3x)}{x \cos(2x)}$

The denominator goes to zero and the numerator doesn't, so we look for a vertical asymptote. Near $x = \pi/4$ we have $\sin(3x)$ is negative, x is positive, and $\cos(2x)$ is near zero, but for $x > \pi/4$, $2x > \pi/2$, so $\cos(x)$ is negative. So altogether the expression is positive, and

$$\lim_{x \rightarrow (\pi/4)^+} \frac{\sin(3x)}{x \cos(2x)} = +\infty$$

5. $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x \cos(2x)}$

Here we need our special limits: $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x \cos(2x)} = \lim_{x \rightarrow 0} \frac{\sin(3x)}{3x} \cdot \frac{3}{\cos(2x)} = 1 \cdot \frac{3}{1} = 3$