

# Calculus I

## Computing limits with direct substitution

Todor Milev

2019

## Example (Limit with Direct Substitution)

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

## Example (Limit with Direct Substitution)

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

Plug in 3:  $\frac{(3) + 2}{\sqrt{(3) - 1}((3) + 1)^2} = \frac{?}{?}$

## Example (Limit with Direct Substitution)

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

Plug in 3:  $\frac{(3) + 2}{\sqrt{(3) - 1}((3) + 1)^2} = \frac{5}{?}$

## Example (Limit with Direct Substitution)

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

Plug in 3:  $\frac{(3) + 2}{\sqrt{(3) - 1}((3) + 1)^2} = \frac{5}{?}$

## Example (Limit with Direct Substitution)

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

Plug in 3:  $\frac{(3) + 2}{\sqrt{(3) - 1}((3) + 1)^2} = \frac{5}{16\sqrt{2}}$

## Example (Limit with Direct Substitution)

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

Plug in 3:  $\frac{(3) + 2}{\sqrt{(3) - 1}((3) + 1)^2} = \frac{5}{16\sqrt{2}}$

Therefore  $\lim_{x \rightarrow 3} \frac{x + 2}{\sqrt{x - 1}(x + 1)^2} = \frac{5}{16\sqrt{2}}.$

## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$



## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$

Plug in 3:  $\frac{(3)^3 - 3(3)^2 + (3) - 3}{(3)^2 - 7(3) + 12} = \frac{?}{?}$

## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$

Plug in 3:  $\frac{(3)^3 - 3(3)^2 + (3) - 3}{(3)^2 - 7(3) + 12} = \frac{0}{?}$

## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$

Plug in 3:  $\frac{(3)^3 - 3(3)^2 + (3) - 3}{(3)^2 - 7(3) + 12} = \frac{0}{?}$

## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$

Plug in 3:  $\frac{(3)^3 - 3(3)^2 + (3) - 3}{(3)^2 - 7(3) + 12} = \frac{0}{0}$

## Example (Limit in Which Direct Substitution Doesn't Work)

Find  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + x - 3}{x^2 - 7x + 12}$

Plug in 3:  $\frac{(3)^3 - 3(3)^2 + (3) - 3}{(3)^2 - 7(3) + 12} = \frac{0}{0}$

Zero over zero is undefined, so we can't use direct substitution.