



# Notes 3.5 - Limits Introduction

## \* WARM UP \*

Evaluate.

$$f(x) = x^2 - 4$$

$$f(-1) = -3$$

$$f(-3) = 5$$

$$f(0) = -4$$

$$g(x) = 2\sin x$$

$$g(0) = 0$$

$$g\left(\frac{\pi}{4}\right) = \sqrt{2}$$

$$g\left(\frac{11\pi}{6}\right) = -1$$



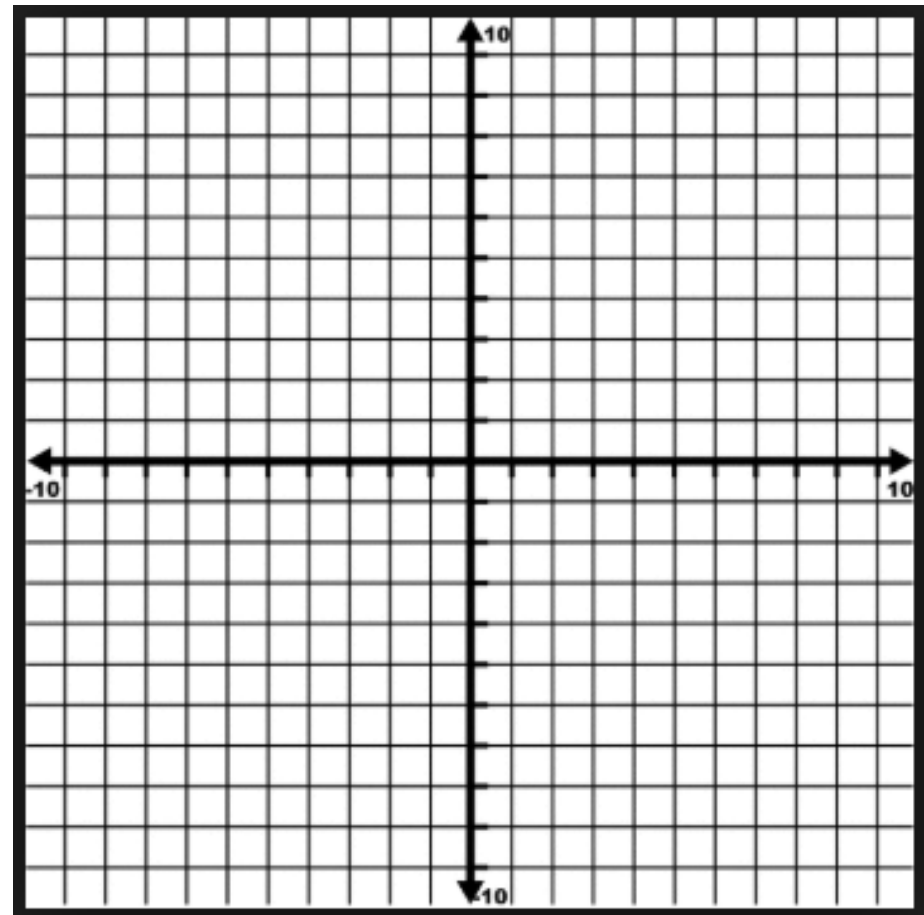
# Notes 3.5 - Limits Introduction

## \* EXPLORATION \*

Consider the function

$$f(x) = \frac{x^2 + 3x - 28}{x - 4}$$

$$\frac{(x+7)\cancel{(x-4)}}{\cancel{x-4}}$$
$$x + 7$$





# Notes 3.5 - Limits Introduction

## \* EXPLORATION \*

$x$			3.9	3.99	4	4.01	4.1		
$f(x)$			10.9	10.99	UND	11.01	11.1		

$$f(x) = \frac{x^2 + 3x - 28}{x - 4}$$

$$\lim_{x \rightarrow 4} f(x) = 11$$





## Notes 3.5 - Limits Introduction

### Limit Notation

$$\lim_{x \rightarrow a} f(x) = b$$

READ: "The limit of  $f(x)$  as  $x$  approaches  $a$  is  $b$ ."

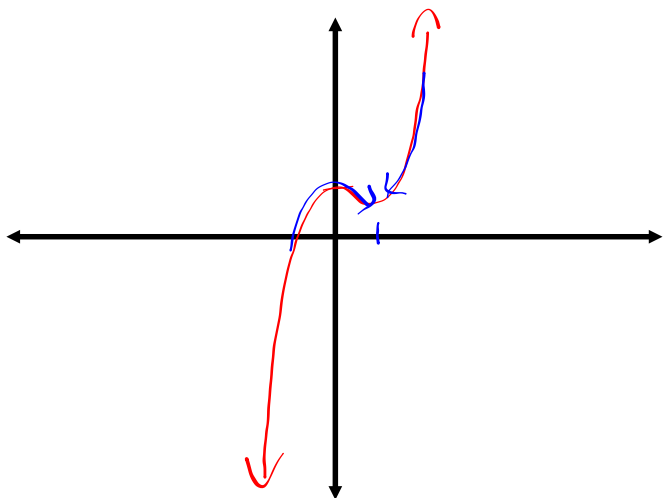




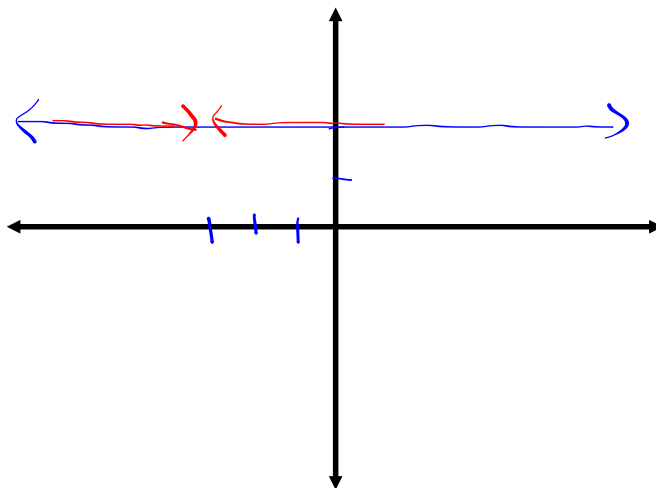
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Evaluate each limit.

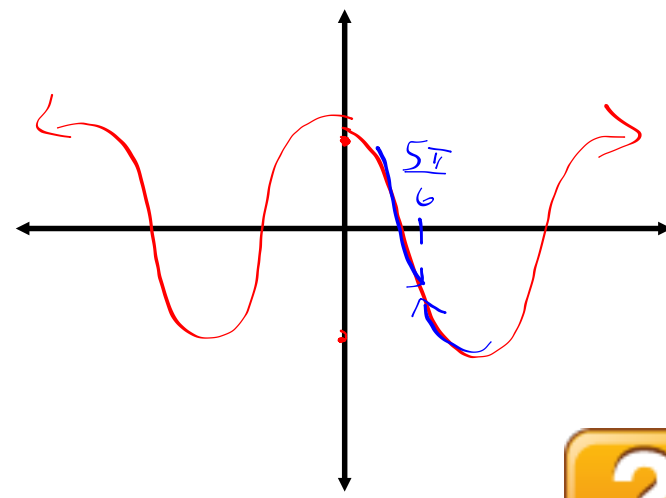
$$\lim_{x \rightarrow 1} (x^3 - x^2 + 1) = 1$$



$$\lim_{x \rightarrow -3} 2 = 2$$



$$\lim_{x \rightarrow \frac{5\pi}{6}} \cos x = -\frac{\sqrt{3}}{2}$$





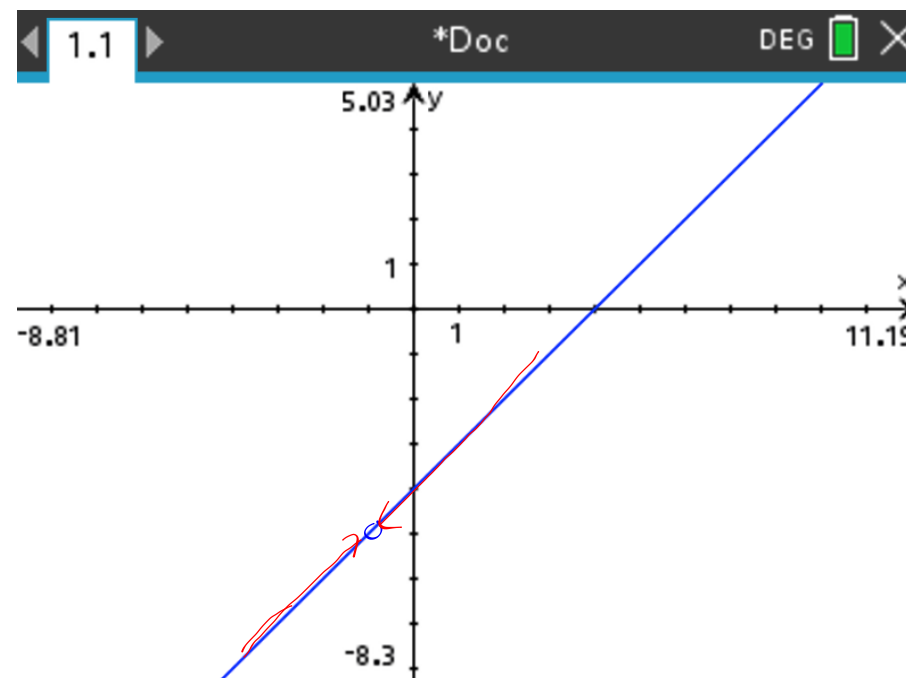
# Notes 3.5 - Limits Introduction

Evaluate the limit.

FACTORIZING

$$\lim_{x \rightarrow -1} \frac{x^2 - 3x - 4}{x + 1} = -5$$

$$\frac{(x - 4)(\cancel{x + 1})}{\cancel{x + 1}}$$





## Notes 3.5 - Limits Introduction

Evaluate the limit.

COMPLEX FRACTIONS

$$\lim_{x \rightarrow -5} \frac{\frac{x}{1}}{\frac{5+x}{5}} = 0$$

$$\frac{(5) \frac{x}{1}}{(5) \frac{5+x}{5}}$$

$$\frac{x}{\frac{5-5-x}{5(5+x)}}$$

$$\frac{x}{\frac{-x}{5(5+x)}}$$

$$\frac{x \cdot 5(5+x)}{-x}$$

$$-5(5+x)$$

$$-5(5+(-5))$$





## Notes 3.5 - Limits Introduction

Evaluate the limit.

CONJUGATE

$$\lim_{x \rightarrow 9} \frac{x-9}{\sqrt{x}-3} = 6$$

$$\frac{x-9(\sqrt{x}+3)}{(\sqrt{x}-3)(\sqrt{x}+3)}$$

$$\frac{(x-9)(\sqrt{x}+3)}{x-9}$$

$$\cancel{x-9}$$

$$\sqrt{x}+3$$





$$(x+3)(x-3)$$

$$x^2 - 9$$

