

## Review of Limits

$$\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{x^4 - 16}$$

$$\lim_{x \rightarrow \infty} \frac{(2 - 3x^2)^2}{(2x^2 + 1)(3x^2 - 5)}$$

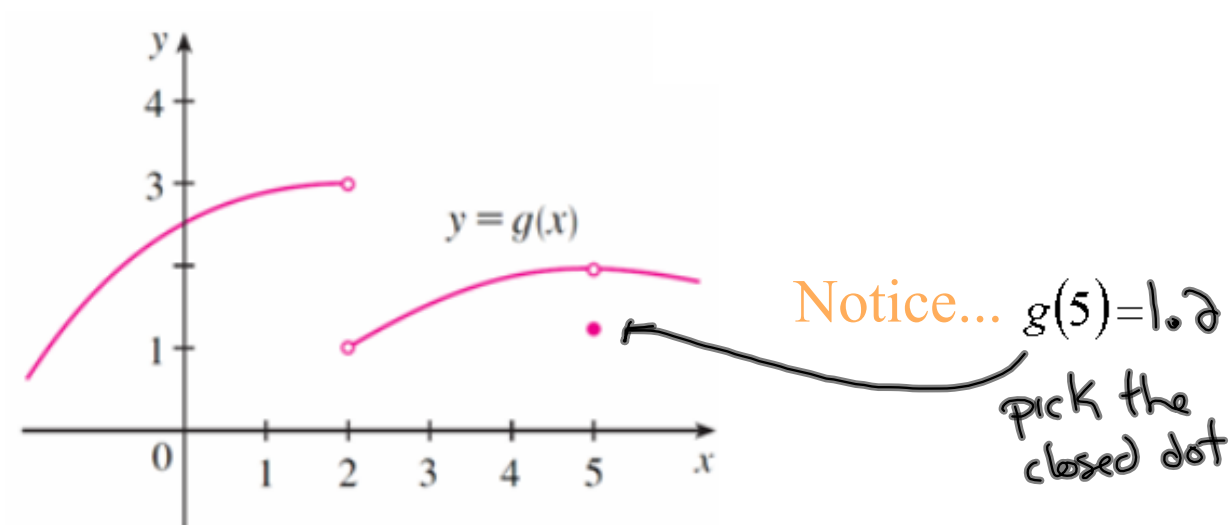
$$\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{(x^2 - 4)(x^2 + 4)}$$

$$\lim_{x \rightarrow \infty} \frac{4 - 12x^2 + 9x^4}{6x^4 - 7x^2 - 5} = \frac{9}{6} = \boxed{\frac{3}{2}}$$

$$\lim_{x \rightarrow 2} \frac{(\sqrt{x} - \sqrt{2})(\sqrt{x} + \sqrt{2})}{(x-2)(x+2)(x^2+4)(\sqrt{x} + \sqrt{2})}$$

$$\lim_{x \rightarrow 2} \frac{\cancel{(x-2)}}{\cancel{(x-2)}(x+2)(x^2+4)(\sqrt{x} + \sqrt{2})}$$

$$= \frac{1}{(4)(8)(2\sqrt{2})} = \frac{1 \cdot \sqrt{2}}{64\sqrt{2} \cdot \sqrt{2}} = \boxed{\frac{\sqrt{2}}{128}}$$



1.  $\lim_{x \rightarrow 2^-} g(x) = \boxed{3}$

"as x approaches 2 from the left"

2.  $\lim_{x \rightarrow 2^+} g(x) = \boxed{1}$

"as x approaches 2 from the right"

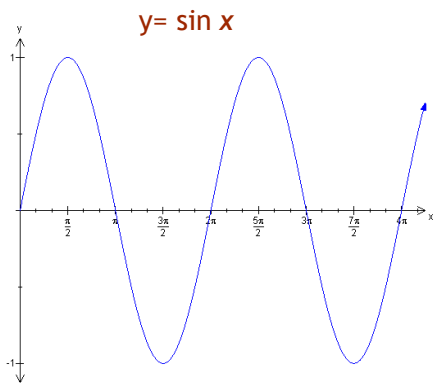
3.  $\lim_{x \rightarrow 2} g(x) = \boxed{\text{DNE}}$

4.  $\lim_{x \rightarrow 5^-} g(x) = \boxed{2}$

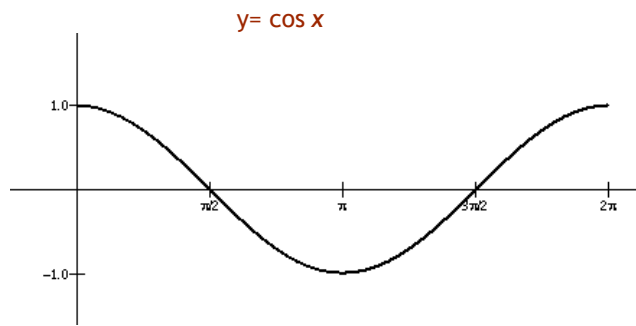
5.  $\lim_{x \rightarrow 5^+} g(x) = \boxed{2}$

6.  $\lim_{x \rightarrow 5} g(x) = \boxed{2}$

## Limits of Trigonometric Functions



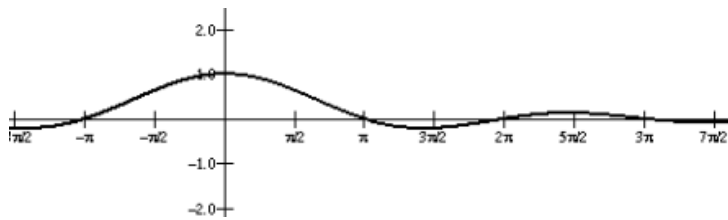
$$\lim_{x \rightarrow 0} \sin x = 0$$



$$\lim_{x \rightarrow 0} \cos x = 1$$

Here is the graph of

$$y = \frac{\sin x}{x}$$



X	Y1
-3	.04704
-2	.45465
-1	.84147
0	ERROR
1	.84147
2	.45465
3	.04704

X=-3

Examine the following limit...

$$\lim_{x \rightarrow 0} \frac{\sin x}{x}$$

**Identity**

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\lim_{x \rightarrow 0} \frac{x}{\sin x} = 1$$

## Examples:

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{5x} \cdot 5$$

$$5 \lim_{x \rightarrow 0} \frac{\sin 5x}{5x}$$

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

$$\lim_{x \rightarrow 0} \frac{8x}{\sin 5x}$$

$$\lim_{x \rightarrow 0} \frac{5x}{\sin 5x} \cdot \frac{8}{5}$$

$$= (1) \left( \frac{8}{5} \right) = \boxed{\frac{8}{5}}$$

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{4x}{\sin x} \xrightarrow{\text{Direct Sub}} \lim_{x \rightarrow \frac{\pi}{4}} \frac{6x}{\cos 3x} = \frac{0}{1} = \boxed{0}$$

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{4(\frac{\pi}{4})}{\sin(\frac{\pi}{4})}$$

$$= \frac{\pi \div \frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = \frac{2\pi}{\sqrt{2}} = \frac{2\pi\sqrt{2}}{2}$$

$$= \boxed{\pi\sqrt{2}}$$

$$\lim_{x \rightarrow 0} \frac{\sin 2x}{\tan 7x}$$

$$\lim_{x \rightarrow 0} \frac{\sin 2x}{1} \div \frac{\sin 7x}{\cos 7x}$$

$$\lim_{x \rightarrow 0} \sin 2x \cdot \frac{\cos 7x}{\sin 7x}$$

$$\lim_{x \rightarrow 0} \frac{\sin 2x}{2x} \cdot \frac{7x}{\sin 7x} \cdot \frac{\cos 7x}{1} \cdot \frac{2x}{7x}$$

$$= (1)(1)(1) \left( \frac{2}{7} \right) = \boxed{\frac{2}{7}}$$

$$\lim_{x \rightarrow 0} \frac{\sin^3 2x}{5x^3 + 10x^4} \leftarrow \text{Factor}$$

$$\lim_{x \rightarrow 0} \frac{\sin^3 2x}{5x^3(1+2x)}$$

$$\lim_{x \rightarrow 0} \frac{\sin^3 2x}{x^3} \cdot \frac{1}{5(1+2x)}$$

$$\lim_{x \rightarrow 0} \left( \frac{\sin 2x}{2x} \right)^3 \cdot \frac{1(8)}{5(1+2x)}$$

$$= (1)^3 \cdot \frac{8}{5} = \boxed{\frac{8}{5}}$$

# Homework

Page 306 & 307

#7, 9, 15, 16, 18, 20, 22, 23, 26, 27, 31, 37