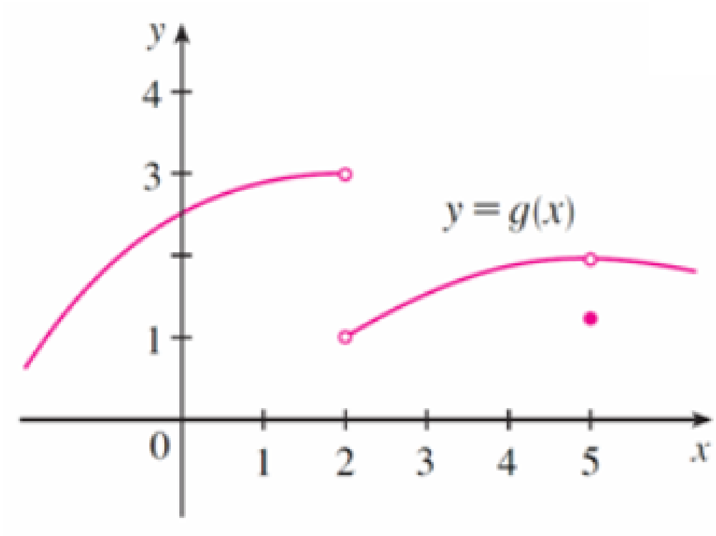


Notice... $g(5) =$

1. $\lim_{x \to 2^-} g(x) = \square$

"as x approaches 2 from the left"

2. $\lim_{x \to 2^+} g(x) = \square$

"as x approaches 2 from the right"

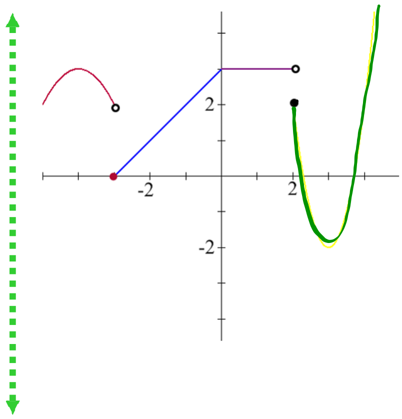
3. $\lim_{x \to 2} g(x) = \square$

4. $\lim_{x \to 5^-} g(x) = \square$

5. $\lim_{x \to 5^+} g(x) = \square$

6. $\lim_{x \to 5} g(x) = \square$

Questions from Homework



a) $\lim_{x \to -3^+} f(x) = 0$

b) $\lim_{x \to -3^-} f(x) = 2$

* $\lim_{x \to -3} f(x) = \text{DNE}$

c) $f(3) = 0$ (closed dot)

① c) $\lim_{x \to 1} \frac{(x+2)^3 - 27}{x-1}$

diff of cubes: $a^3 - b^3 = (a-b)(a^2+ab+b^2)$

$\lim_{x \to 1} \frac{[(x+2)-3][(x+2)^2 + 3(x+2) + 9]}{x-1}$ ($a - b$, $a^2 + ab + b^2$)

$\lim_{x \to 1} \frac{(x-1)[(x+2)^2 + 3(x+2) + 9]}{(x-1)} = 9 + 9 + 9 = 27$

---

① c) $(x+2)(x+2)(x+2)$

$(x+2)(x^2+4x+4)$

$x^3 + 4x^2 + 4x + 2x^2 + 8x + 8$

$x^3 + 6x^2 + 12x + 8$

$\lim_{x \to 1} \frac{(x+2)^3 - 27}{x-1}$

$\lim_{x \to 1} \frac{x^3 + 6x^2 + 12x + 8 - 27}{x-1}$

$\lim_{x \to 1} \frac{x^3 + 6x^2 + 12x - 19}{x-1}$

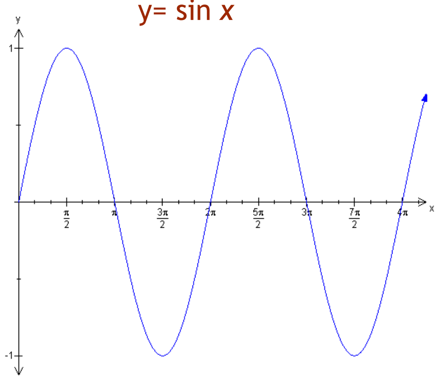
synthetic sub

1	1	6	12	-19
		1	7	19
	1	7	19	

$\lim_{x \to 1} \frac{(x-1)(x^2+7x+19)}{(x-1)} = 27$

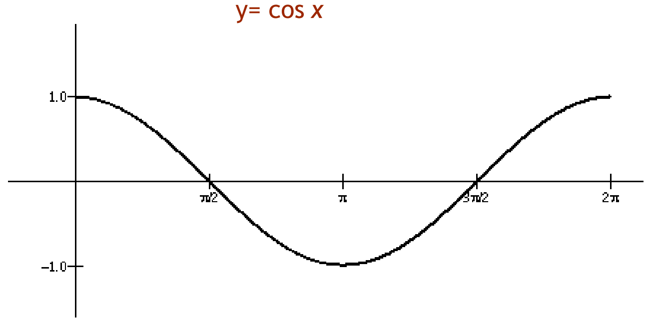
Limits of Trigonometric Functions

y= sin *x*



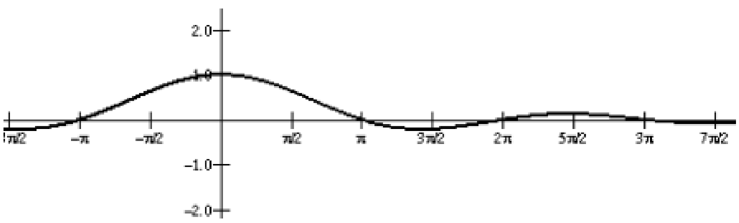
$$\lim_{x \to 0} \sin x = 0$$

y= cos *x*



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

Here is the graph of $y = \dfrac{\sin x}{x}$



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

X= -3

Examine the following limit... $\lim_{x \to 0} \dfrac{\sin x}{x}$

Identity

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

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

Examples:

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

$$= 5\lim_{x\to 0}\frac{\sin 5x}{5x}$$

$$= 5(1)$$

$$= 5$$

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

$$= \lim_{x\to 0}\frac{8x}{5x}\left(\frac{5x}{\sin 5x}\right)$$

$$= \frac{8}{5}\lim_{x\to 0}\frac{5x}{\sin 5x}$$

$$= \frac{8}{5}(1) = \frac{8}{5}$$

$$\lim_{x\to\frac{\pi}{4}}\frac{4x}{\sin x}$$

Direct substitution

$$= \frac{4\left(\frac{\pi}{4}\right)}{\sin\left(\frac{\pi}{4}\right)}$$

$$= \pi \div \frac{1}{\sqrt{2}}$$

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

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

$$\lim_{x\to 0}\frac{6x}{\cos 3x}$$

$$= \frac{6(0)}{\cos(3\cdot 0)}$$

$$= \frac{0}{\cos(0)}$$

$$= \frac{0}{1}$$

$$= 0$$

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

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

$$= \lim_{x\to 0}\sin 2x\,\frac{\cos 7x}{\sin 7x}$$

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

$$= \frac{2}{7}\lim_{x\to 0}\frac{\sin 2x}{2x}\lim_{x\to 0}\frac{\cos 7x}{1}\lim_{x\to 0}\frac{7x}{\sin 7x}$$

$$= \frac{2}{7}(1)(1)(1)$$

$$= \frac{2}{7}$$

$$\lim_{x\to 0}\frac{\sin^3 2x}{5x^3+10x^4}$$

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

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

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

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

$$= 8(1)^3\left(\frac{1}{5}\right)$$

$$= \frac{8}{5}$$

Homework

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