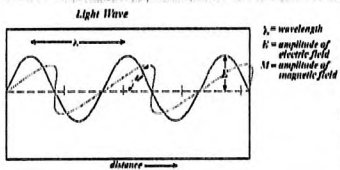


# Trig Graphs

Dec 4-9:49 AM

The graphs in this section are probably the most commonly used in all areas of science and engineering. They are used for modeling many different natural and mechanical phenomena (populations, waves, engines, acoustics, electronics, UV intensity, growth of plants and animals, etc).



Dec 4-9:49 AM

The trigonometric graphs in this chapter are periodic, which means the shape repeats itself exactly after a certain amount of time. Anything that has a regular cycle (like the tides, temperatures, rotation of the earth, etc) can be modelled using a sine or cosine curve.

### Harmonic motion sound wave

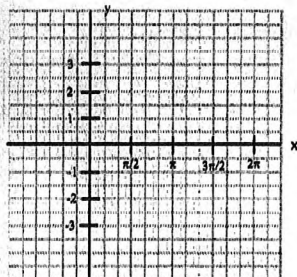


Dec 4-9:49 AM

In order for the graph to be as close to mathematically sound as possible, the ratio of the x-axis:y-axis must be  $\pi/6:1/2$ .

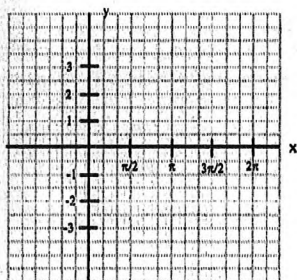
Dec 4-9:49 AM

x	sin x
0	0
0.1	0.0998
0.2	0.1985
0.3	0.2955
0.4	0.3921
0.5	0.4794
0.6	0.5638
0.7	0.6428
0.8	0.7174
0.9	0.7833
1.0	0.8415
1.1	0.8912
1.2	0.9317
1.3	0.9613
1.4	0.9802
1.5	0.9975
1.6	0.9999
1.7	0.9963
1.8	0.9760
1.9	0.9413
2.0	0.9093
2.1	0.8718
2.2	0.8293
2.3	0.7826
2.4	0.7314
2.5	0.6755
2.6	0.6149
2.7	0.5497
2.8	0.4809
2.9	0.4084
3.0	0.3320
3.1	0.2524
3.2	0.1700
3.3	0.0848
3.4	0.0000
3.5	-0.0674
3.6	-0.1376
3.7	-0.2095
3.8	-0.2823
3.9	-0.3558
4.0	-0.4298
4.1	-0.5042
4.2	-0.5789
4.3	-0.6540
4.4	-0.7294
4.5	-0.8051
4.6	-0.8811
4.7	-0.9573
4.8	-0.9936
4.9	-0.9999
5.0	-0.9563
5.1	-0.8912
5.2	-0.8166
5.3	-0.7334
5.4	-0.6418
5.5	-0.5420
5.6	-0.4352
5.7	-0.3217
5.8	-0.2018
5.9	-0.0757
6.0	0.0471
6.1	0.1671
6.2	0.2833
6.3	0.3957
6.4	0.5043
6.5	0.6092
6.6	0.7104
6.7	0.8079
6.8	0.9017
6.9	0.9918
7.0	0.9983
7.1	0.9903
7.2	0.9680
7.3	0.9317
7.4	0.8818
7.5	0.8185
7.6	0.7421
7.7	0.6529
7.8	0.5521
7.9	0.4408
8.0	0.3199
8.1	0.1905
8.2	0.0537
8.3	-0.0896
8.4	-0.2298
8.5	-0.3672
8.6	-0.5011
8.7	-0.6318
8.8	-0.7596
8.9	-0.8848
9.0	-0.9963
9.1	-0.9936
9.2	-0.9760
9.3	-0.9443
9.4	-0.8986
9.5	-0.8399
9.6	-0.7684
9.7	-0.6843
9.8	-0.5879
9.9	-0.4804
10.0	-0.3528
10.1	-0.2154
10.2	-0.0695
10.3	0.0845
10.4	0.2298
10.5	0.3672
10.6	0.5011
10.7	0.6318
10.8	0.7596
10.9	0.8848
11.0	0.9963
11.1	0.9936
11.2	0.9760
11.3	0.9443
11.4	0.8986
11.5	0.8399
11.6	0.7684
11.7	0.6843
11.8	0.5879
11.9	0.4804
12.0	0.3528
12.1	0.2154
12.2	0.0695
12.3	-0.0845
12.4	-0.2298
12.5	-0.3672
12.6	-0.5011
12.7	-0.6318
12.8	-0.7596
12.9	-0.8848
13.0	-0.9963
13.1	-0.9936
13.2	-0.9760
13.3	-0.9443
13.4	-0.8986
13.5	-0.8399
13.6	-0.7684
13.7	-0.6843
13.8	-0.5879
13.9	-0.4804
14.0	-0.3528
14.1	-0.2154
14.2	-0.0695
14.3	0.0845
14.4	0.2298
14.5	0.3672
14.6	0.5011
14.7	0.6318
14.8	0.7596
14.9	0.8848
15.0	0.9963
15.1	0.9936
15.2	0.9760
15.3	0.9443
15.4	0.8986
15.5	0.8399
15.6	0.7684
15.7	0.6843
15.8	0.5879
15.9	0.4804
16.0	0.3528
16.1	0.2154
16.2	0.0695
16.3	-0.0845
16.4	-0.2298
16.5	-0.3672
16.6	-0.5



Dec 4-9:49 AM

X	COS X
0	1.0000
1	0.9999
2	0.9994
3	0.9985
4	0.9972
5	0.9955
6	0.9934
7	0.9909
8	0.9880
9	0.9847
10	0.9810
11	0.9769
12	0.9724
13	0.9675
14	0.9622
15	0.9565
16	0.9504
17	0.9439
18	0.9370
19	0.9297
20	0.9220
21	0.9139
22	0.9054
23	0.8965
24	0.8872
25	0.8775
26	0.8674
27	0.8569
28	0.8460
29	0.8347
30	0.8230
31	0.8109
32	0.7984
33	0.7855
34	0.7722
35	0.7585
36	0.7444
37	0.7299
38	0.7150
39	0.6997
40	0.6840
41	0.6679
42	0.6514
43	0.6345
44	0.6172
45	0.5995
46	0.5814
47	0.5629
48	0.5440
49	0.5247
50	0.5050
51	0.4849
52	0.4644
53	0.4435
54	0.4222
55	0.4005
56	0.3784
57	0.3559
58	0.3330
59	0.3097
60	0.2860
61	0.2619
62	0.2374
63	0.2125
64	0.1872
65	0.1615
66	0.1354
67	0.1089
68	0.0820
69	0.0547
70	0.0270
71	0.0000
72	-0.0270
73	-0.0547
74	-0.0820
75	-0.1089
76	-0.1354
77	-0.1615
78	-0.1872
79	-0.2125
80	-0.2374
81	-0.2619
82	-0.2860
83	-0.3097
84	-0.3330
85	-0.3559
86	-0.3784
87	-0.4005
88	-0.4222
89	-0.4435
90	-0.4644
91	-0.4849
92	-0.5050
93	-0.5247
94	-0.5440
95	-0.5629
96	-0.5814
97	-0.5995
98	-0.6172
99	-0.6345
100	-0.6514
101	-0.6679
102	-0.6840
103	-0.6997
104	-0.7150
105	-0.7299
106	-0.7444
107	-0.7585
108	-0.7722
109	-0.7855
110	-0.7984
111	-0.8109
112	-0.8230
113	-0.8347
114	-0.8460
115	-0.8569
116	-0.8674
117	-0.8775
118	-0.8872
119	-0.8965
120	-0.9054
121	-0.9139
122	-0.9220
123	-0.9297
124	-0.9370
125	-0.9439
126	-0.9504
127	-0.9565
128	-0.9622
129	-0.9675
130	-0.9724
131	-0.9769
132	-0.9810
133	-0.9847
134	-0.9880
135	-0.9909
136	-0.9934
137	-0.9955
138	-0.9972
139	-0.9985
140	-0.9994
141	-0.9999
142	-1.0000



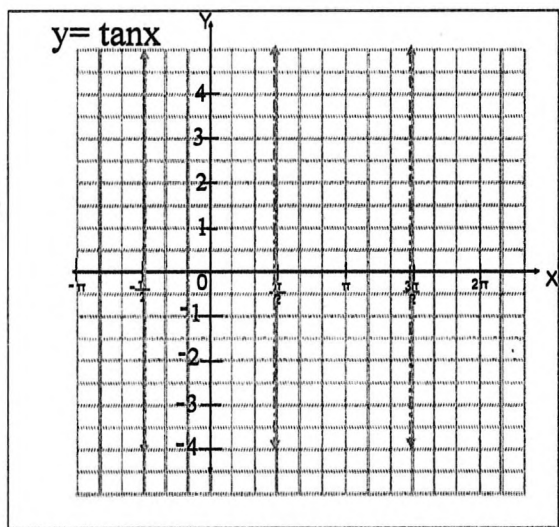
Dec 4-9:49 AM

# DAY 2 The Tangent Function

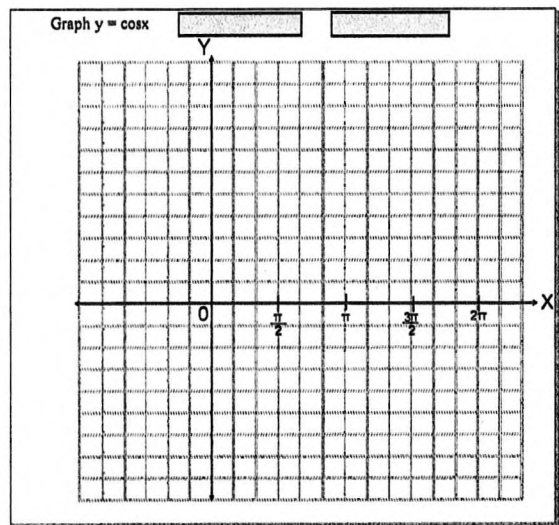
$\tan x =$

	0	90	180	270	360
$\sin x$					
$\cos x$					
$\tan x$					

Feb 23-8:43 AM

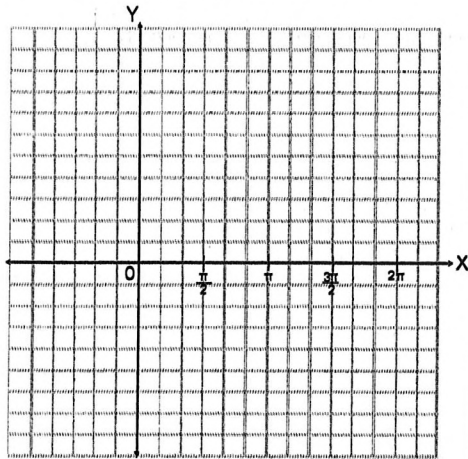


Feb 23-9:06 AM



Feb 11-10:24 AM

Graph  $y = \sin x$



Feb 11-10:27 AM

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What did you notice from the following graphs?

$$y = \cos x$$

$$y = \sin x$$

$$y = 2\cos x$$

$$y = \sin 1/2x$$

$$y = 3\cos x$$

$$y = \sin 2x$$

Can you come up with a rule?

Feb 11-10:30 AM

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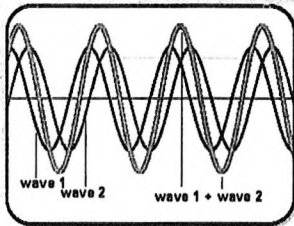
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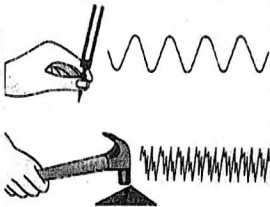
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## Amplitude, Frequency and Period of Trig. Graphs



Jan 21-7:59 AM

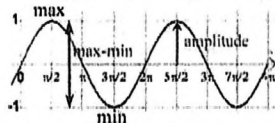
A sine wave, or sinusoid, is the graph of the sine function in trigonometry. In addition to mathematics, this function also occurs in other fields of study such as science and engineering. This wave pattern also occurs in nature as seen in ocean waves, sound waves and light waves.



Jan 21-7:59 AM

The **amplitude** of a function describes the "height" of the graph.

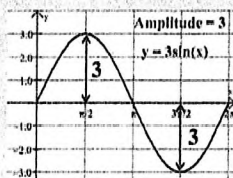
$$\text{amplitude} = \frac{1}{2} |\text{max} - \text{min}|$$



Jan 21-7:59 AM

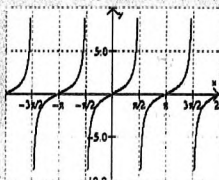


For  $y = a\sin(bx)$  and  $y = a\cos(bx)$ , the amplitude =  $|a|$



Jan 21-7:59 AM

For  $y = a\tan(bx)$ , there is no amplitude.



Jan 21-7:59 AM

Find the amplitude of the following trig graphs:

1).  $y = 3\sin x$

2).  $y = 1/3\sin x$

3).  $y = -2\cos x$

4).  $y = 4\tan x$

Jan 21-7:59 AM

The **frequency** of a trigonometric function is the number of cycles it completes in a given interval. This interval is generally  $2\pi$  radians (or  $360^\circ$ ) for the sine and cosine curves.

For  $y = a\sin(bx)$  and  $y = a\cos(bx)$ , the frequency =  $|b|$

For  $y = a\tan(bx)$ , the frequency =  $2|b|$

Jan 21-7:59 AM

Find the frequency of the following trig graphs:

1).  $y = \sin 3x$

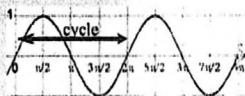
2).  $y = 2\sin x$

3).  $y = \cos(1/2)x$

4).  $y = \tan 2x$

Jan 21-7:59 AM

The **period** of the trig. function is the horizontal length needed to complete one complete cycle of the graph.



Period =  $2\pi$   
freq.

This sine curve,  $y = \sin x$ , has a period of  $2\pi$ , the horizontal length of one complete cycle.

Jan 21-7:59 AM



Find the period length of the following trig graphs:

1).  $y = -2\sin 2x$

2).  $y = 4\cos x$

3).  $y = \tan(1/2)x$

4).  $y = \sin(1/2)x$

Jan 21-7:59 AM

State the amplitude, frequency and period length of the following trig. graphs:

1).  $y = 3\sin 2x$

2).  $y = 4\cos x$

Jan 21-7:59 AM

3).  $y = 1/2\tan 2x$

4).  $y = -3\sin(1/2)x$

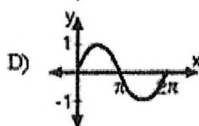
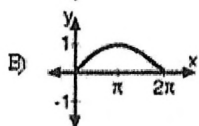
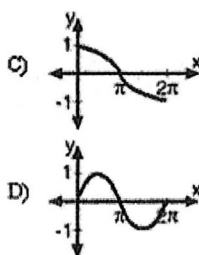
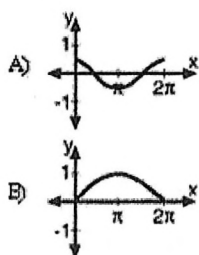
Jan 21-7:59 AM

Name: \_\_\_\_\_ Date: \_\_\_\_\_

- 1) What is the period of the graph of the equation
- $y = 2 \sin 4x$
- ?

A)  $8\pi$                       C)  $\pi$   
 B)  $4\pi$                       D)  $\frac{\pi}{2}$

- 2) Which graph represents the equation
- $y = \frac{1}{2} \cos x$
- ?



- 3) Which value is
- not*
- in the range of the function
- $y = \cos x$
- ?

A) 1                      C)  $-\frac{1}{2}$   
 B)  $\frac{1}{2}$                       D) 2

- 4) What is the range of the function
- $y = 4 \cos 3x$
- ?

A)  $y \leq 3$                       C)  $-3 \leq y \leq 3$   
 B)  $-4 \leq y \leq 4$                       D) all real numbers

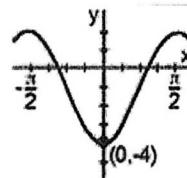
- 5) As
- $x$
- increases from
- $\pi$
- to
- $2\pi$
- , the value of
- $\sin x$

A) decreases, then increases  
 B) increases, only  
 C) decreases, only  
 D) increases, then decreases

- 6) If
- $f(x) = 3 \sin 2x + c$
- , what is the
- maximum*
- value of
- $f(x)$
- ?

A)  $c$                       C)  $c + 5$   
 B)  $c + 3$                       D)  $c + 2$

- 7) What is the amplitude of the graph of
- $y = a \sin b(x + c) + d$
- ?

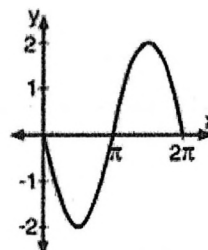


A) -1                      B) 2                      C) 3                      D) 4

- 8) What is the frequency of the graph of the equation
- $y = -\sin 2x$
- ?

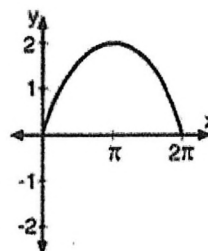
A) 1                      B) -1                      C) 2                      D)  $\frac{1}{2}$

- 9) What equation is represented by the graph below?



A)  $y = 2 \sin x$                       C)  $y = \sin(2x)$   
 B)  $y = -\sin(2x)$                       D)  $y = -2 \sin x$

- 10) What equation is represented by the graph below?



A)  $y = 2 \sin(\frac{1}{2}x)$                       C)  $y = \frac{1}{2} \cos(2x)$   
 B)  $y = \frac{1}{2} \sin(2x)$                       D)  $y = 2 \cos(\frac{1}{2}x)$

11) Given  $y = -2 \sin x$ , name:

- (a) amplitude
- (b) period in radians
- (c) frequency

12) Given  $y = 3 \cos x$ , name:

- (a) amplitude
- (b) period in radians
- (c) frequency

13) (a) On the same set of axes, sketch and label the graphs of

 $y = 2 \cos\left(\frac{1}{2}x\right)$  and  $y = -1$  for the values of  $x$  in the interval  $0 \leq x \leq 2\pi$ .
(b) State the number of values of  $x$  in the interval
 $0 \leq x \leq 2\pi$  that satisfy the equation  $2 \cos\left(\frac{1}{2}x\right) = -1$ .

14) (a) On the same set of axes, sketch the graphs of

 $y = \frac{1}{2} \sin 2x$  and  $y = 2 \cos \frac{1}{2}x$  over the domain

 $-\pi \leq x \leq \pi$ .
(b) For what value(s) in the interval  $-\pi \leq x \leq \pi$  does

$$\frac{1}{2} \sin 2x = 2 \cos \frac{1}{2}x?$$

15) (a) On the same set of axes, sketch the graphs of

 $y = 2 \sin x$  and  $y = -\cos\left(\frac{1}{2}x\right)$  over the domain  $0 \leq x \leq 2\pi$ .
(b) For what value(s) of  $x$  in the interval  $0 \leq x \leq 2\pi$  does

$$2 \sin x = -\cos\left(\frac{1}{2}x\right)?$$