

13-5 Reteaching

The Cosine Function

Problem

What is the graph of $y = 3 \cos \frac{\pi}{2}\theta$ in the interval from 0 to 2π ?

Step 1 Compare the function to $y = a \cos b\theta$.

Find the amplitude.

Find the period of the curve.

$$a = 3 \text{ and } b = \frac{\pi}{2}$$

$$|a| = |3| = 3$$

$$\frac{2\pi}{b} = \frac{2\pi}{\frac{\pi}{2}} = 4$$

Step 2 Find the minimum and maximum of the curve.

Because the amplitude is 3, the maximum is 3 and the minimum is -3 .

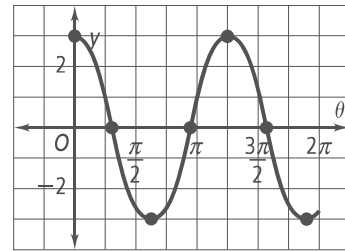
Step 3 Make a table of values. Choose θ -values at intervals of one-fourth the period: $\frac{4}{4} = 1$.

The y -values cycle through the pattern *max-zero-min-zero-max*.

θ	0	1	2	3	4	5	6
y	3	0	-3	0	3	0	-3

Step 4 Plot the points from the table.

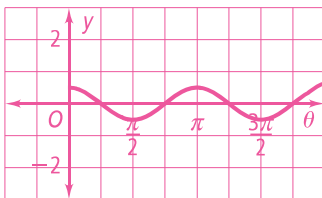
Step 5 Draw a smooth curve through the points.



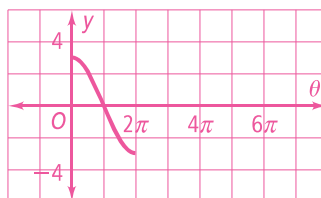
Exercises

Sketch the graph of each function in the interval from 0 to 2π .

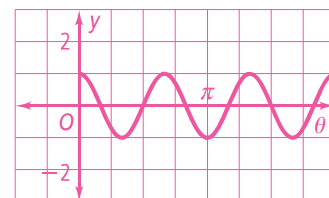
1. $y = \frac{1}{2} \cos 2\theta$



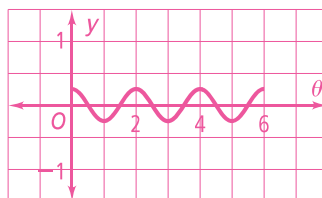
2. $y = 3 \cos \frac{1}{2}\theta$



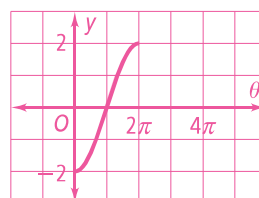
3. $y = \cos 3\theta$



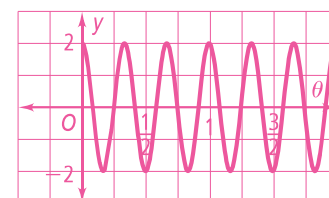
4. $y = \frac{1}{4} \cos \pi\theta$



5. $y = -2 \cos \frac{1}{2}\theta$



6. $y = 2 \cos 6\pi\theta$



13-5 Reteaching (continued)

The Cosine Function

Solving a sine or cosine equation is similar to solving a system of two linear equations. You can graph each side of the equation. The solutions will be the points where the graphs intersect.

Problem

What are the solutions of $3 \cos \frac{1}{2}\theta = 2$ in the interval 0 to 4π ?

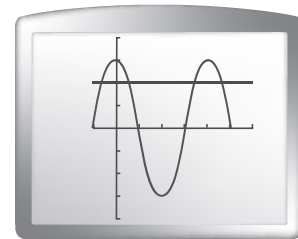
Step 1 Set each side of the equation equal to y .

$$y = 3 \cos \frac{1}{2}\theta$$

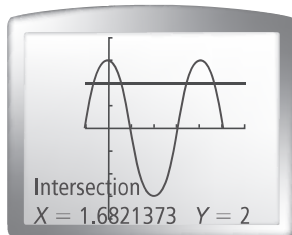
$$y = 2$$

Step 2 Graph each equation on the same grid.

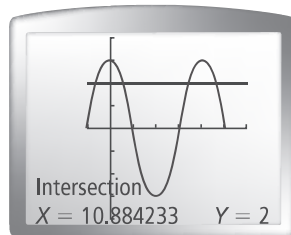
Step 3 Between $\theta = 0$ and $\theta = 4\pi$, the graphs intersect 2 times. Use the **Intersect** feature to find the coordinates of these points.



x Scale: π y Scale: 1



X Scale: π Y Scale: 1



X Scale: π Y Scale: 1

The solutions of $3 \cos \frac{1}{2}\theta = 2$ in the interval 0 to 4π are $\theta \approx 1.68$ and 10.88 .

Exercises

Find all solutions in the interval from 0 to 2π . Round to the nearest hundredth.

7. $-\cos \theta = \frac{3}{4}$

2.42, 3.86

8. $2 \cos \theta = 1$

1.05, 5.24

9. $3 \cos \pi\theta = 2$

0.27, 1.73, 2.27, 3.73,
4.27, 5.73, 6.27

10. $\cos \frac{1}{2}\pi\theta = -0.5$

1.33, 2.67, 5.33

11. $\frac{1}{2} \cos 4\theta = 0$

0.39, 1.18, 1.96,
2.75, 3.53, 4.32,
5.11, 5.89

12. $-3 \cos 2\pi\theta = 2.5$

0.41, 0.59, 1.41, 1.59,
2.41, 2.59, 3.41, 3.59,
4.41, 4.59, 5.41, 5.59

13. $5 \cos 4\theta = 3$

0.23, 1.34, 1.80,
2.91, 3.37, 4.48,
4.94, 6.05

14. $\frac{3}{4} \cos \frac{1}{2}\pi\theta = \frac{1}{2}$

0.54, 3.46, 4.54

15. $-4 \cos 2\theta = 2$

1.05, 2.09, 4.19, 5.24