

2.1 Radian Measure

Answers

1. $\frac{\pi}{2}$

2. $\frac{2\pi}{3}$

3. $\frac{5\pi}{3}$

4. $\frac{11\pi}{6}$

5. $\frac{7\pi}{4}$

6. $\frac{3\pi}{4}$

7. 270°

8. 225°

9. 210°

10. 30°

11. 300°

12. 180°

13. Multiplying by $\frac{\pi}{180}$ is like multiplying by the conversion factor of $\frac{2\pi}{360}$. Dividing by 360 gives you the fraction of the circle you want. Multiplying by 2π gives you the measurement in terms of radians.

14. Multiplying by $\frac{180}{\pi}$ is like multiplying by the conversion factor of $\frac{360}{2\pi}$. Dividing by 2π gives you the fraction of the circle you want. Multiplying by 360 gives you the measurement in terms of degrees.

15. A radian is the length of the radius of the circle. The circumference of a circle is $2\pi r$, or 2π radius lengths. Therefore, the circle is 2π radius lengths or 2π radians.

2.2 Conversion between Degrees and Radians

Answers

1. $\frac{\pi}{2}$

2. 2π

3. $\frac{5\pi}{18}$

4. $\frac{11\pi}{18}$

5. $\frac{3\pi}{4}$

6. $\frac{55\pi}{36}$

7. $\frac{4\pi}{3}$

8. 75°

9. 108°

10. 96°

11. 126°

12. 450°

13. 540°

14. 630°

15. Radians make sense as the length of the arc created by the radius. They also fit well with the formula for area and circumference of a circle.

2.3 Six Trigonometric Functions and Radians

Answers

1. 102.9°

2. 150.0°

3. 130.9°

4. 300°

5. 480°

6. 315°

7. 432°

8. -1

9. 0

10. $\frac{\sqrt{3}}{3}$

11. $\frac{1}{2}$

12. $\sqrt{3}$

13. $\frac{\sqrt{3}}{3}$

14. $\frac{2\sqrt{3}}{3}$

15. Radians do not necessarily have to be written in terms of π . It is possible to have exactly 2 radians.

2.4 Rotations in Radians

Answers

1. 75°
2. 67.5°
3. 127.5°
4. 15°
5. 97.5°
6. 105°
7. 165°
8. 105°
9. 142.5°
10. 165°
11. 157.5°
12. 22.5°
13. 127.5°
14. 12 times
15. At 1:05:27.5

2.5 Length of an Arc

Answers

1. 8π meters
2. 16π meters
3. 32π meters
4. $\frac{3}{10}$ radians
5. 8π inches
6. 12π inches
7. 35π inches
8. 48.02 revolutions
9. 384.8 inches
10. 48π radians
11. $\frac{10\pi}{3}$ inches
12. $\frac{5\pi}{6}$ inches
13. $\frac{55\pi}{12}$ inches
14. $\frac{25\pi}{9}$ inches
15. $\frac{215\pi}{72}$ inches

2.6 Area of a Sector

Answers

1. 22.34 in^2

2. 37.7 in^2

3. 43.98 in^2

4. 65.45 in^2

5. 87.27 in^2

6. $.56 \text{ radians}$

7. 1.875 radians

8. 2.67 radians

9. 6.18 inches

10. 15.14 inches

11. 7.46 inches

12. 8.74 inches

13. 15 in^2

14. 125.67 in^2

15. 226.19 in^2

2.7 Length of a Chord

Answers

1. 1.53 m
2. 14.5 km
3. 3.06 in
4. 1.65 ft
5. 3.32 cm
6. 12.9 in
7. 7.66in
8. 0.68 radians
9. 8.14 in
10. 1.46 radians
11. 9.03 in
12. 2.43 radians
13. The length of the red segment will be $\sqrt{\left\{(\text{radius})^2 - \left(\frac{\text{chord}}{2}\right)^2\right\}}$ by the Pythagorean Theorem.
14. The length of the red segment will be $(\text{radius}) * \cos\left(\frac{\theta}{2}\right)$
15. Find the area of the sector using the radius and the central angle. Then find the area of the triangle using the length of the chord and the length of the red segment. Subtract to find the area of the segment.

2.8 Angular Velocity

Answers

1. Beth went 14π ft and Steve went 28π ft.

2. $\frac{\pi}{6}$ radians per second

3. Beth: $\frac{7\pi}{6}$ ft/sec; Steve: $\frac{14\pi}{6}$ ft/sec

4. 6 feet from the center.

5. 6 seconds

6. Beth: $\frac{7\pi}{3}$ ft/sec; Steve: $\frac{14\pi}{3}$ ft/sec

7. 16 feet from the center

8. 2.67 feet from the center

9. $\frac{\pi}{30}$ radians/minute

10. $\frac{\pi}{360}$ radians/minute

11. $\frac{\pi}{30}$ feet per minute

12. $\frac{\pi}{360}$ feet per minute

13. 19 inches

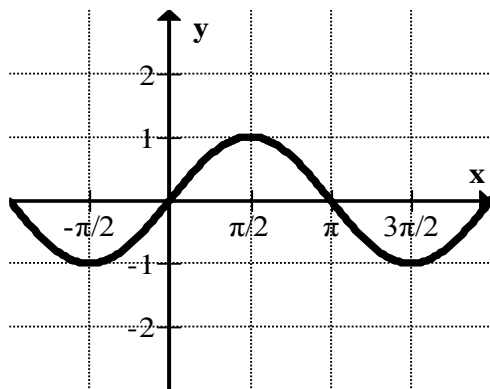
14. 2π radians/minute

15. 0.32 ft or 3.82 inches

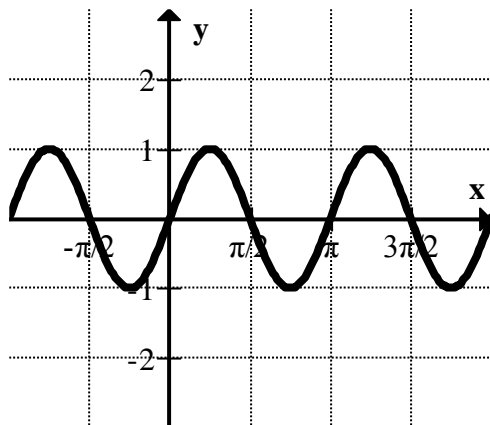
2.9 Sine and Cosecant Graphs

Answers

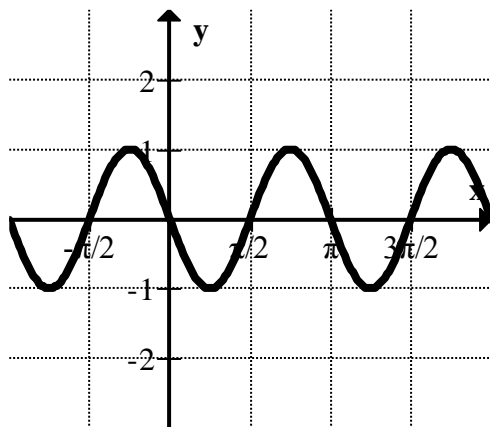
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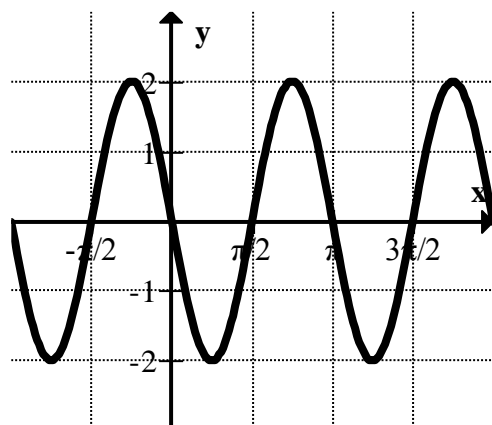
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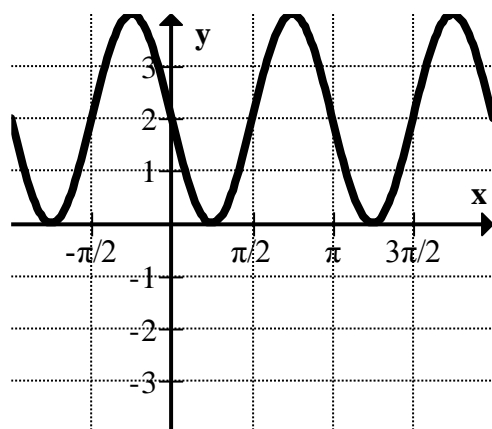
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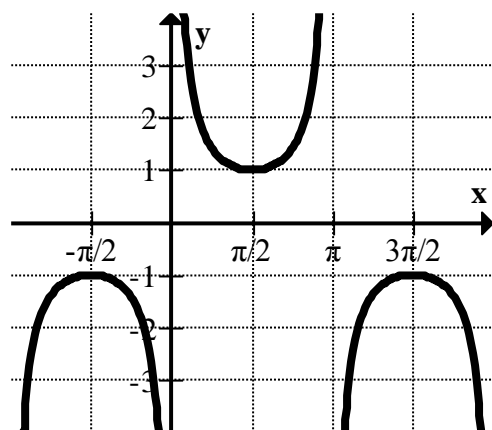
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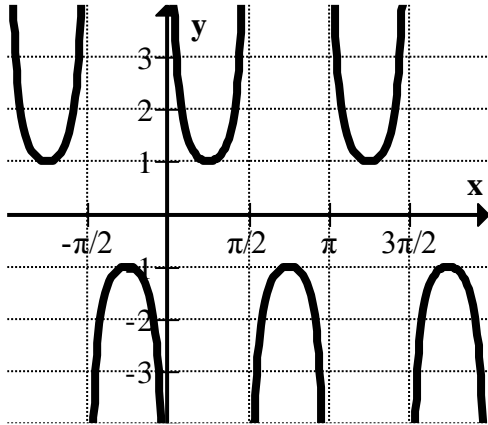
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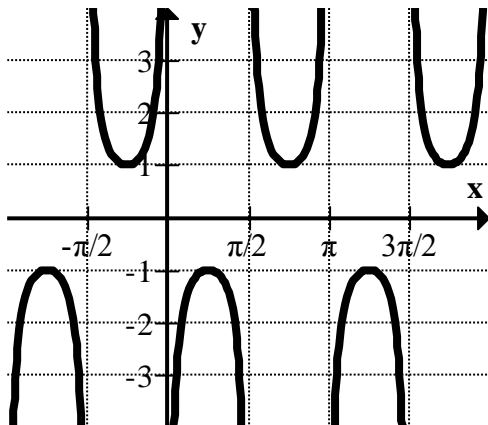
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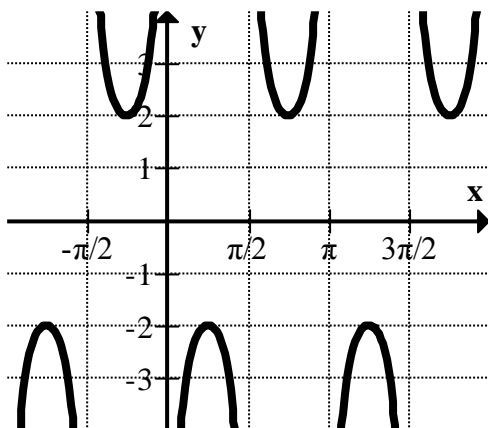
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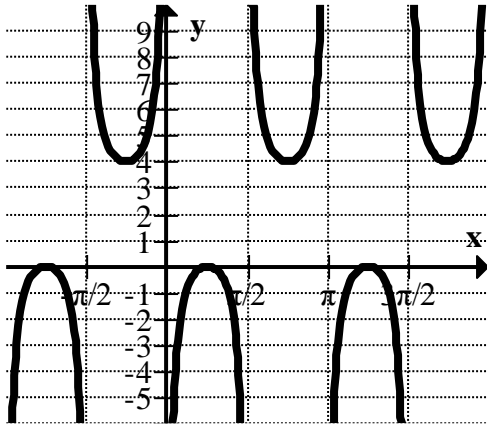
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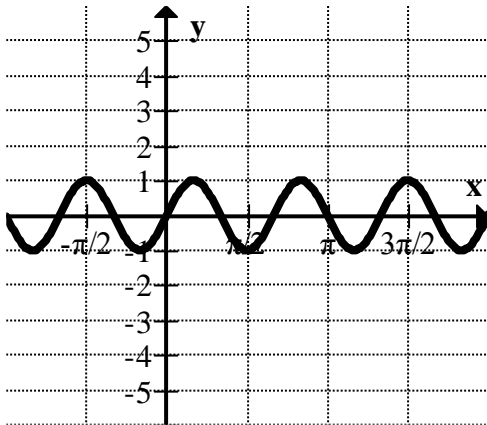
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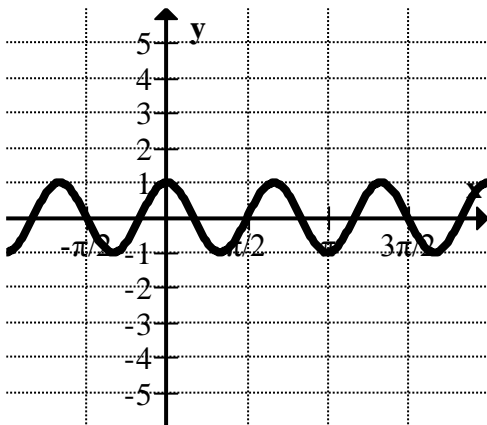
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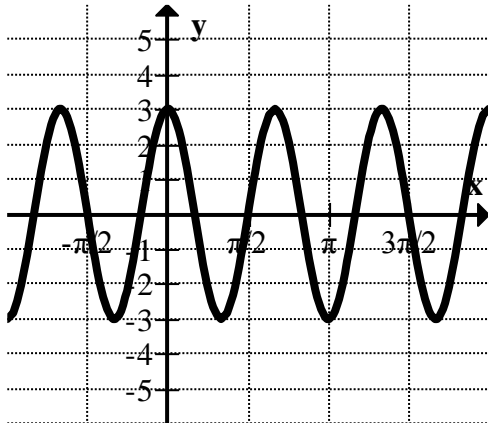
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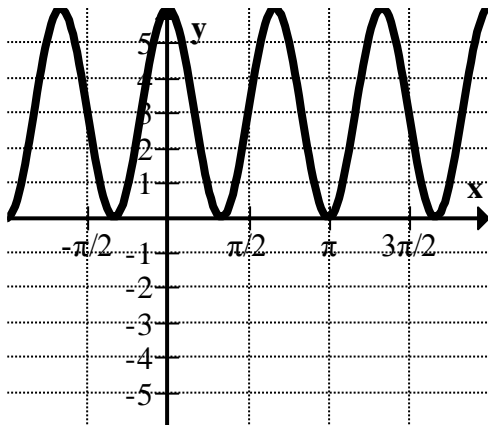
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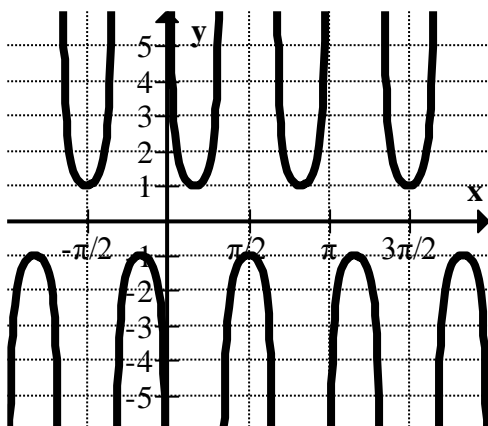
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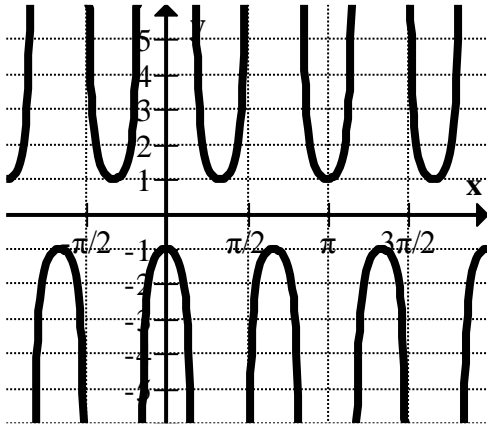
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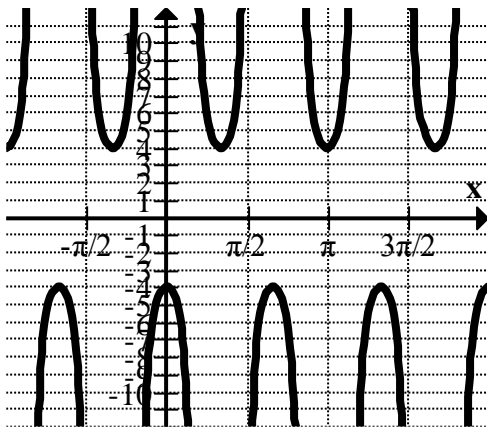
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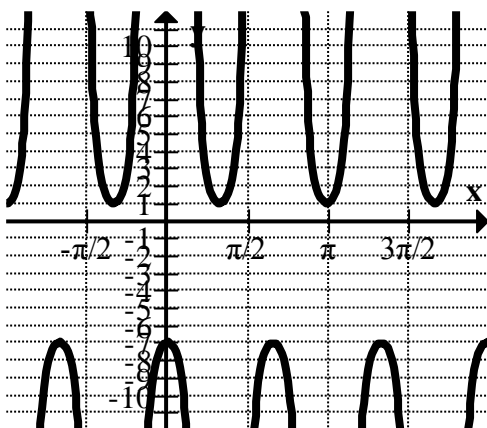
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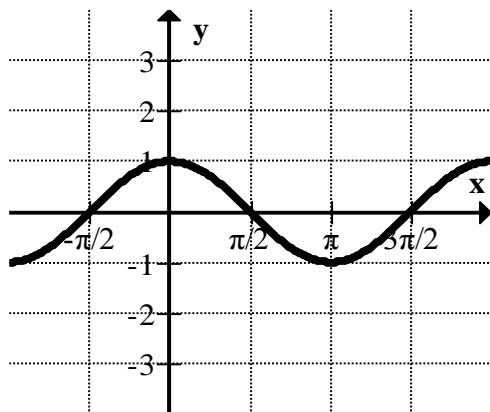
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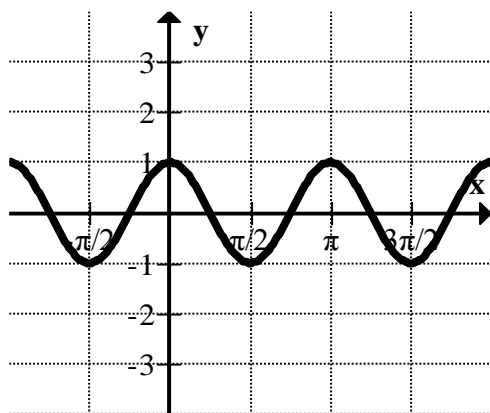
2.10 Cosine and Secant Graphs

Answers

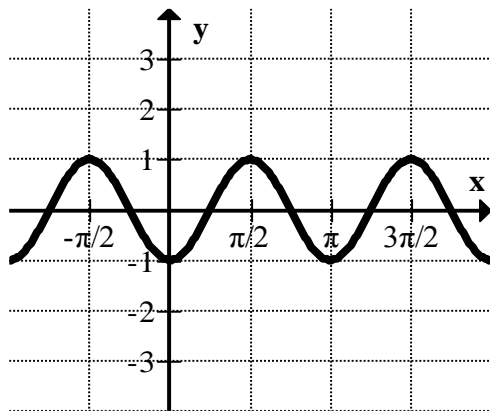
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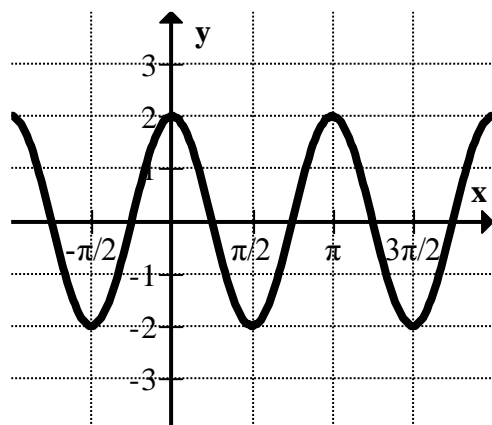
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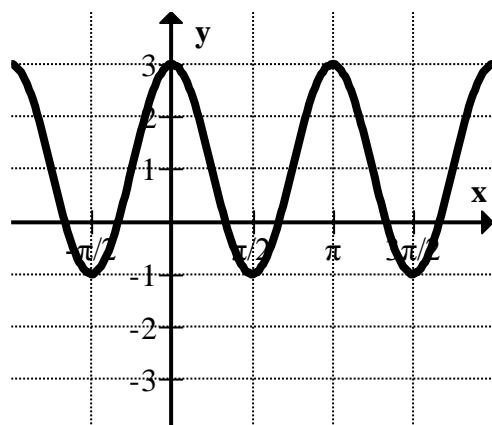
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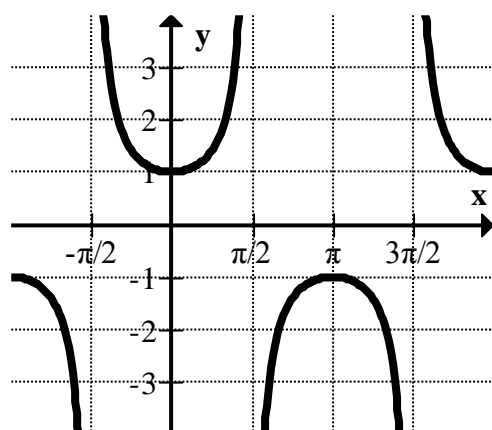
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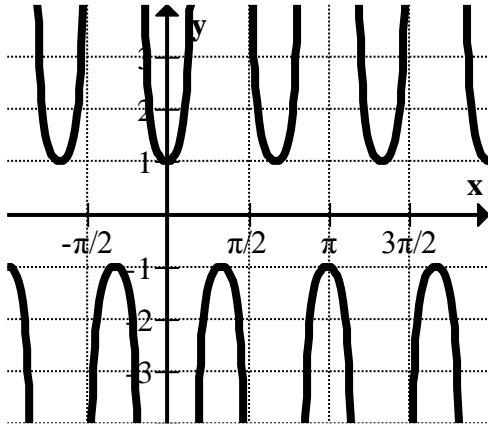
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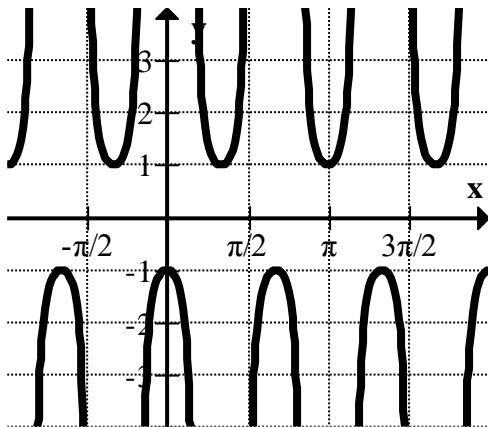
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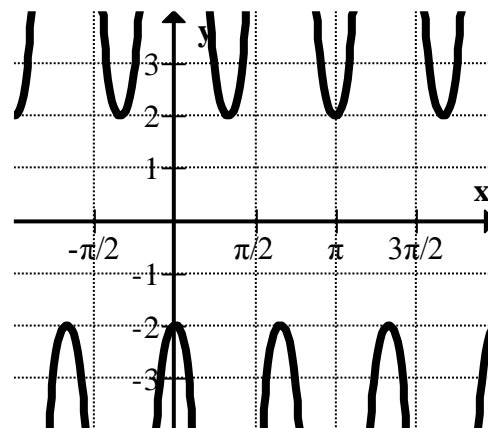
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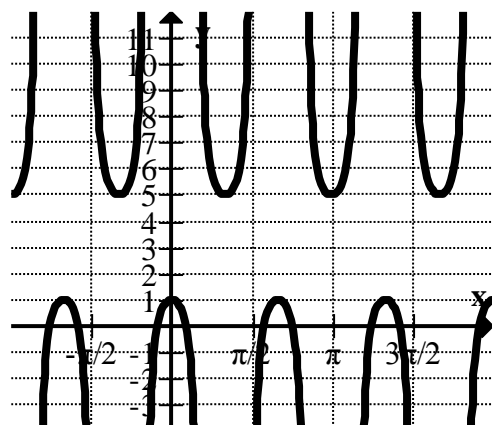
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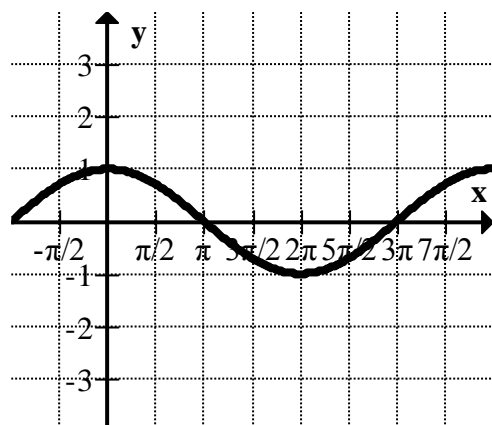
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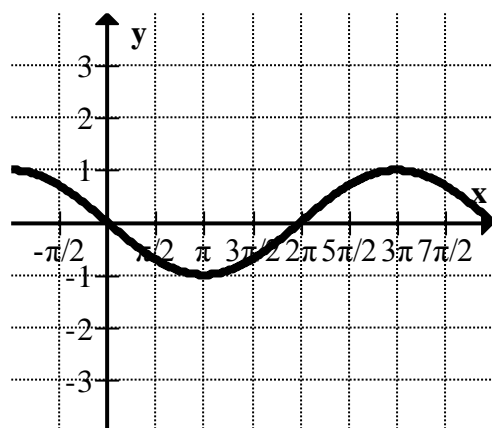
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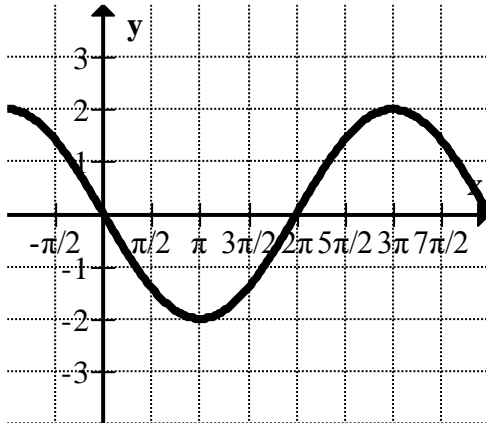
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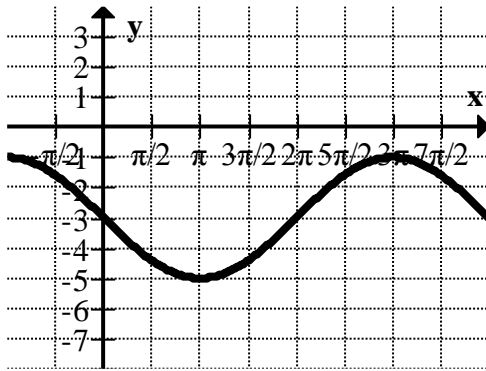
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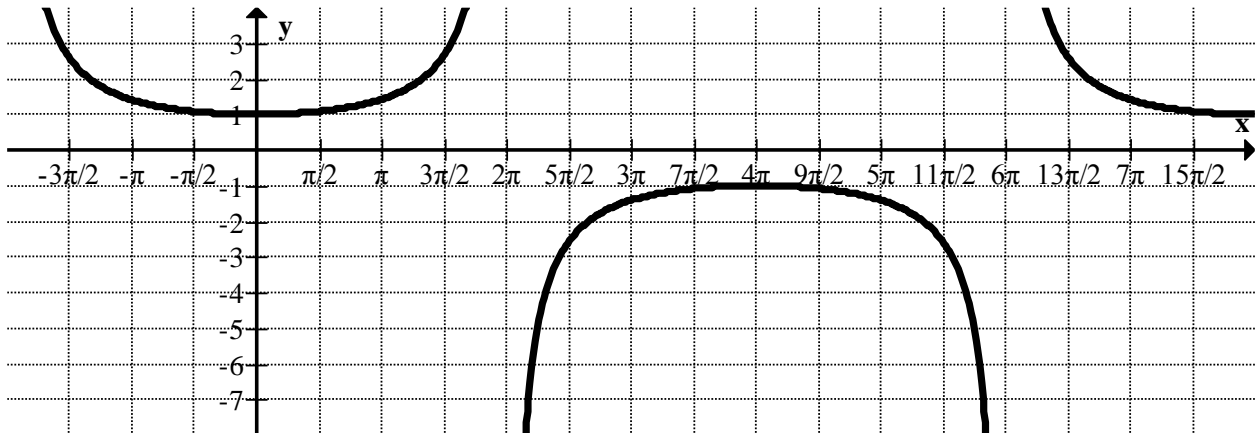
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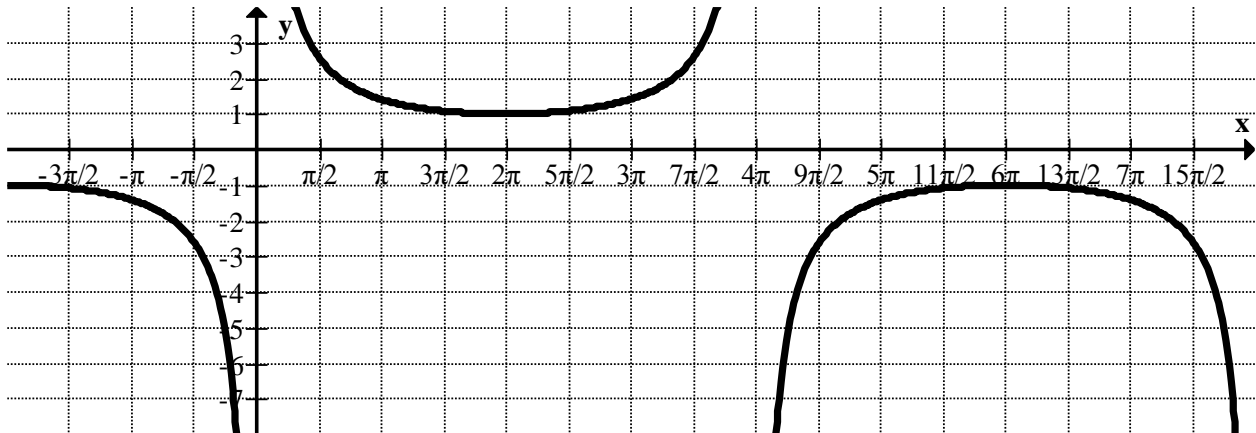
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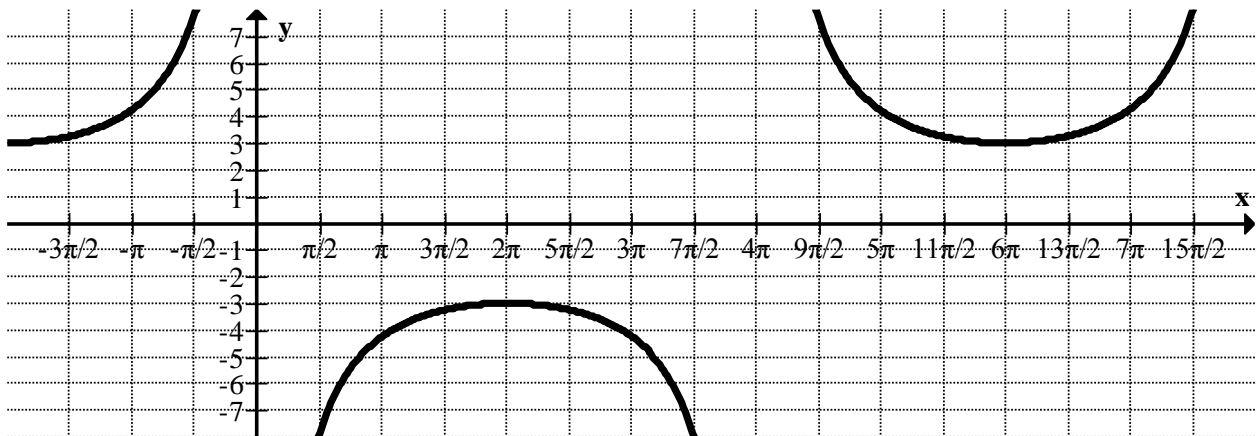
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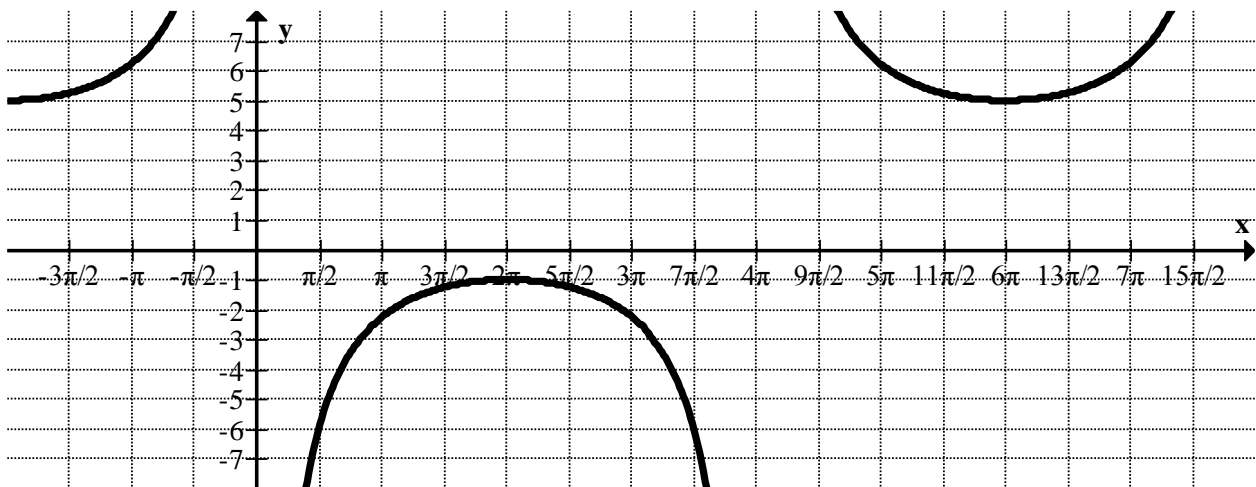
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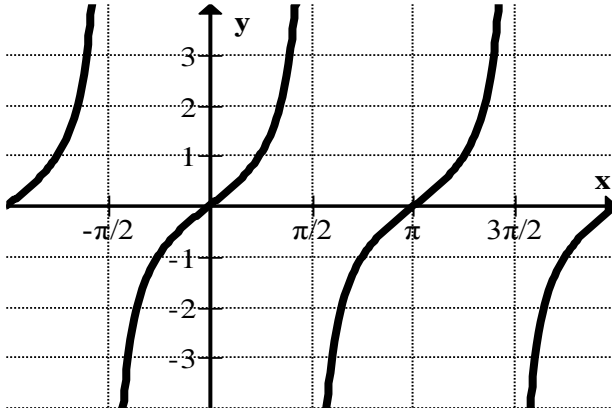
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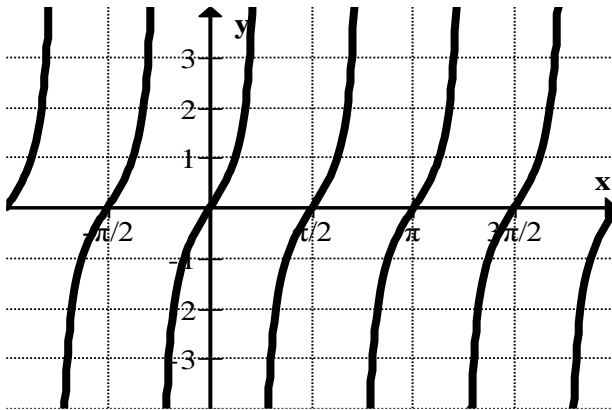
2.11 Tangent and Cotangent Graphs

Answers

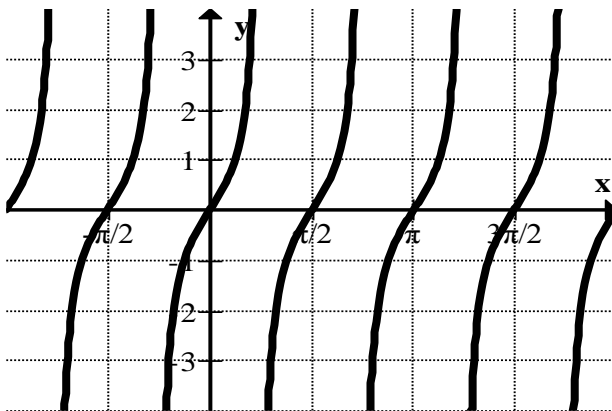
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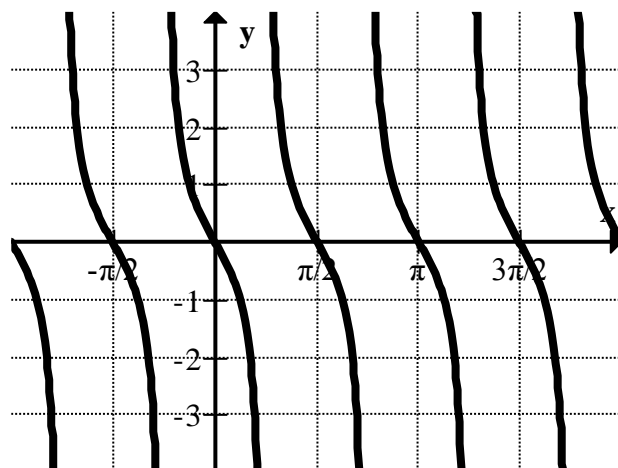
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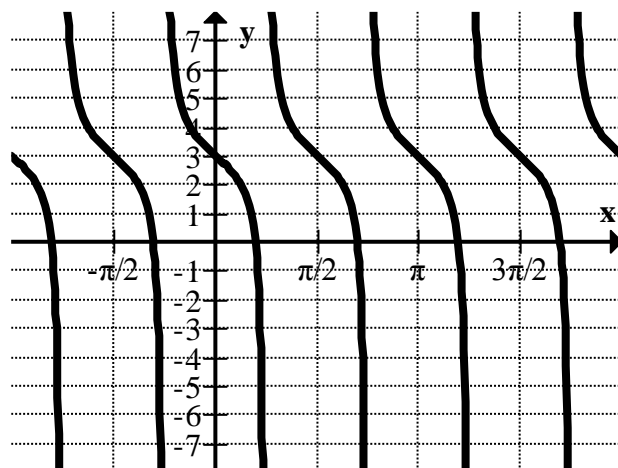
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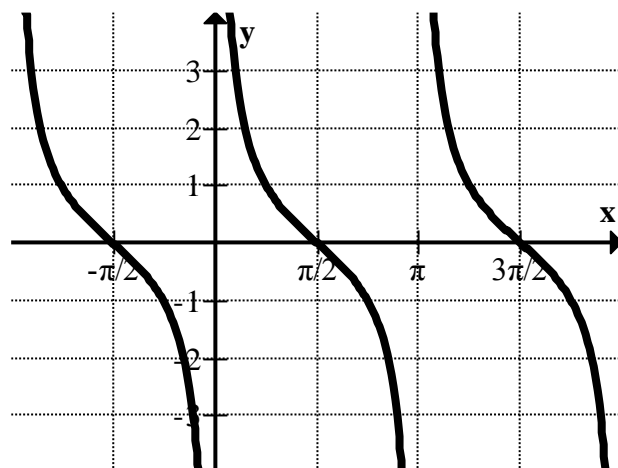
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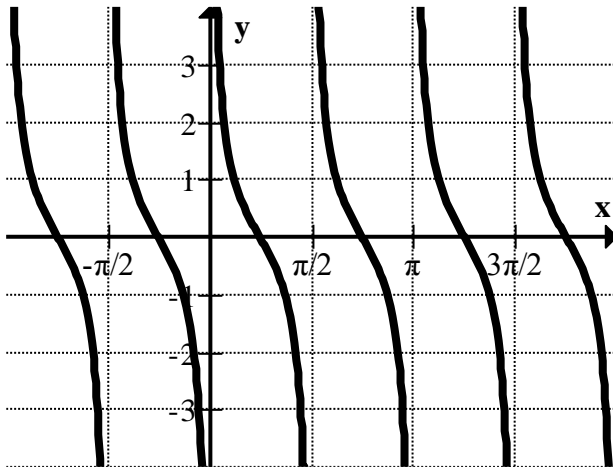
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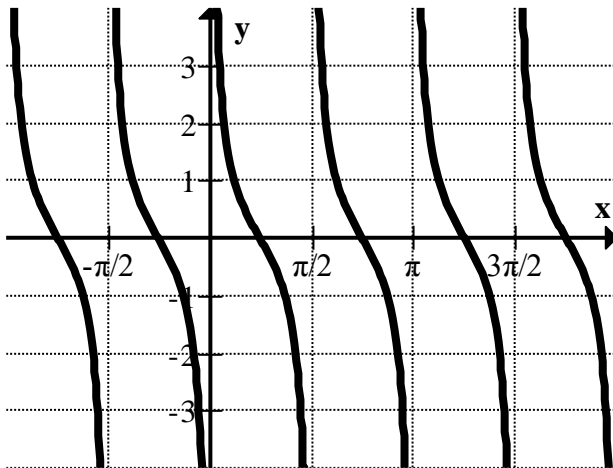
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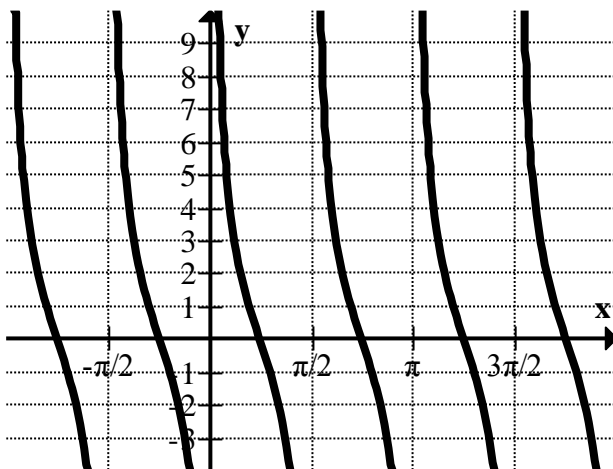
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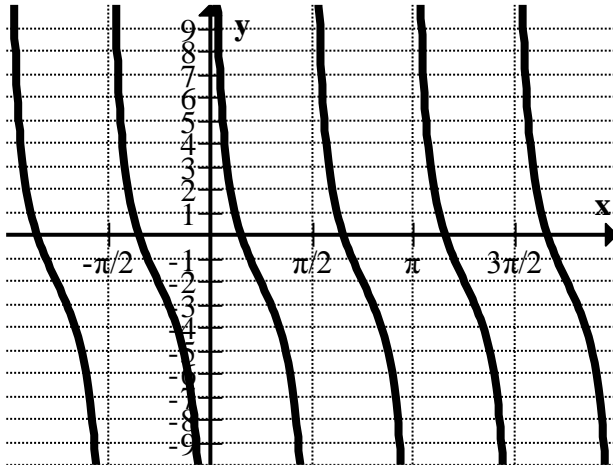
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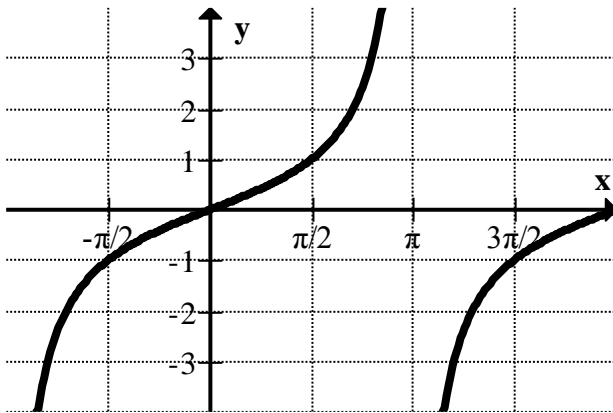
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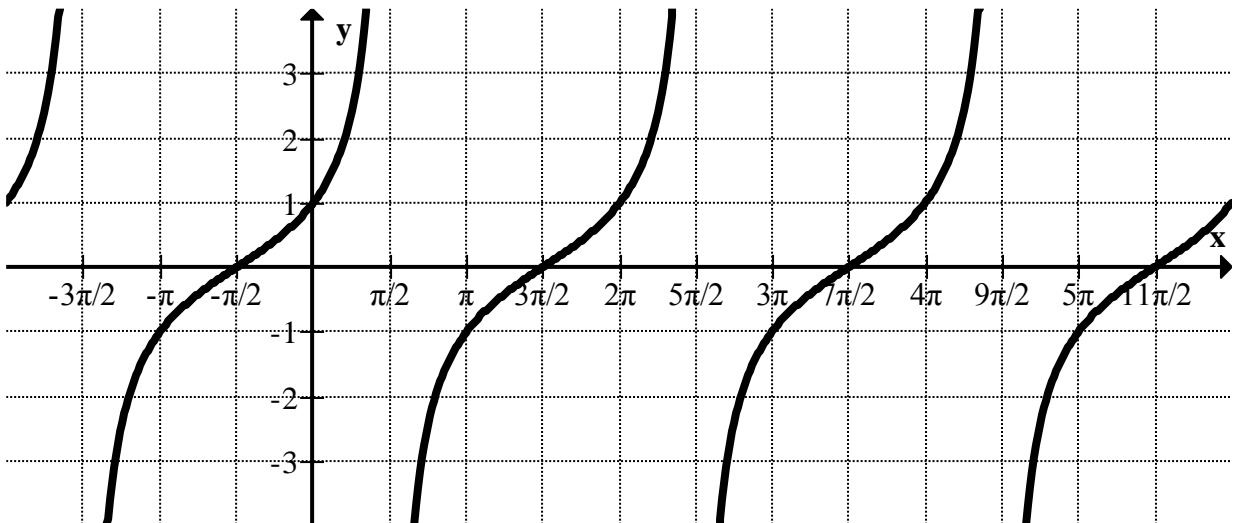
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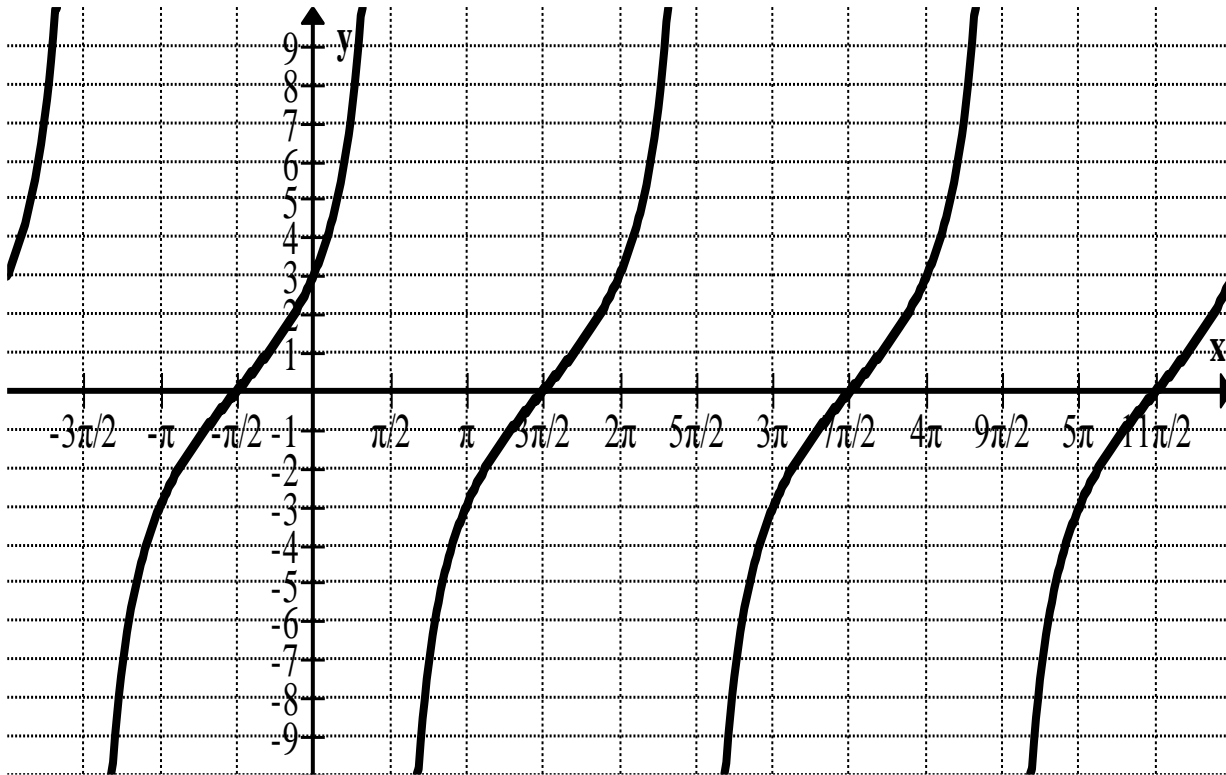
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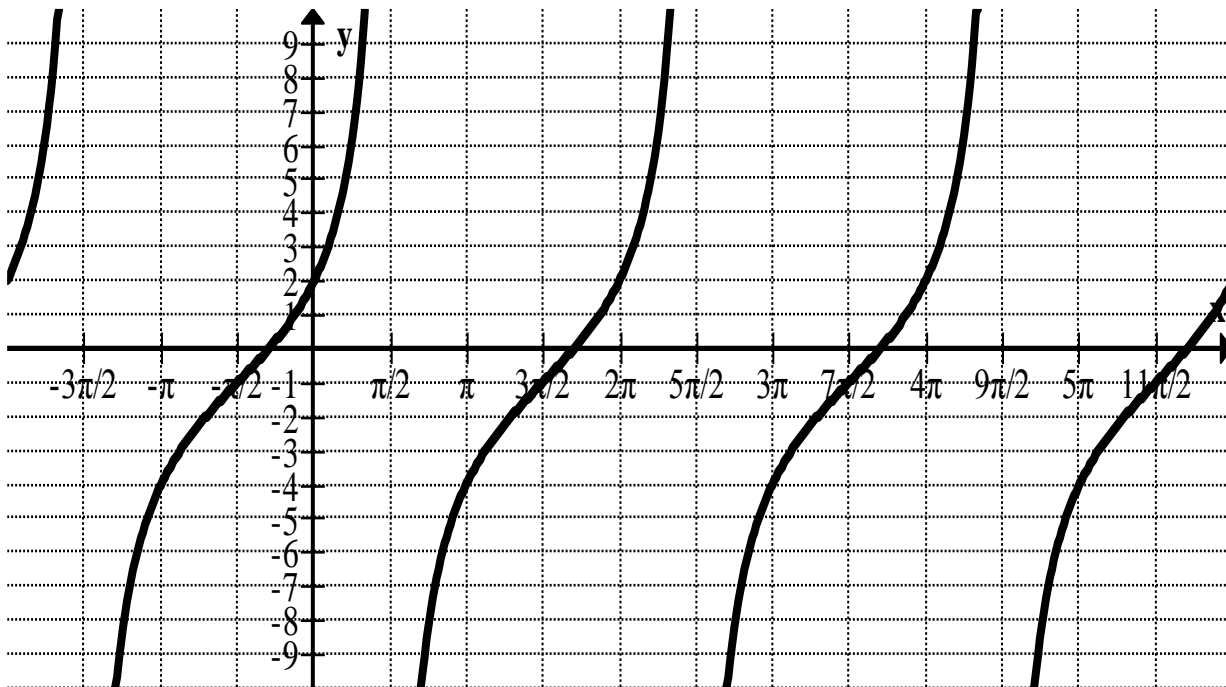
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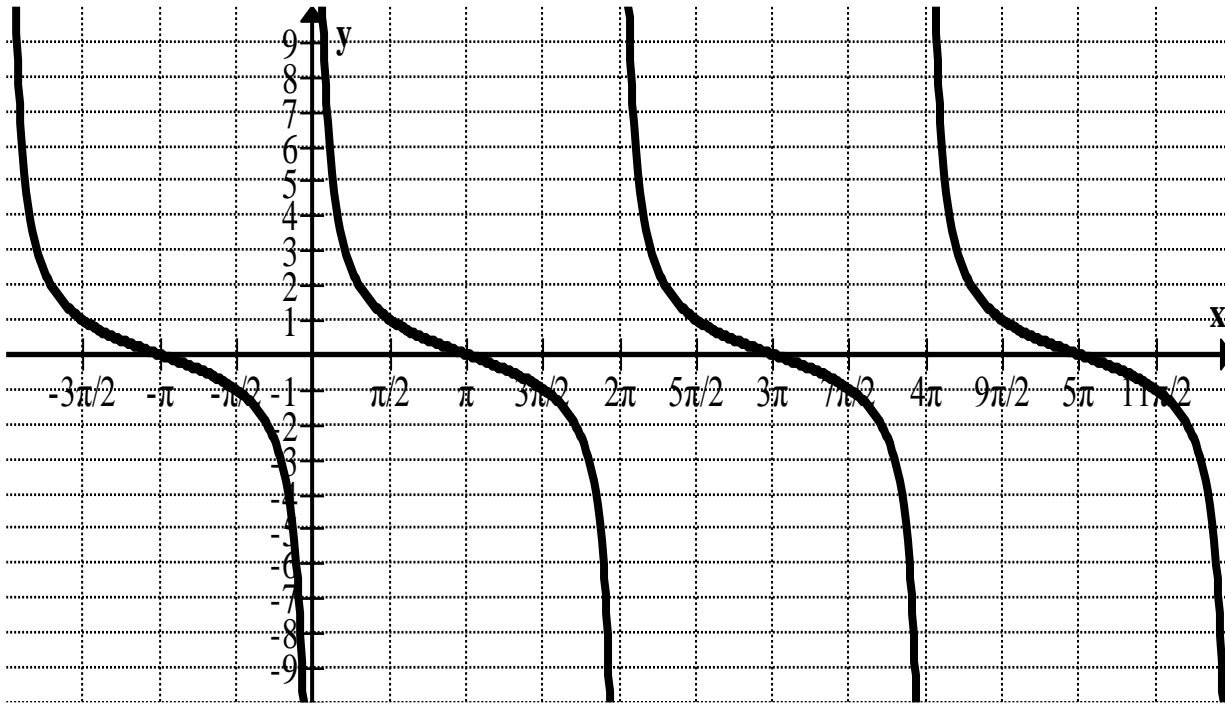
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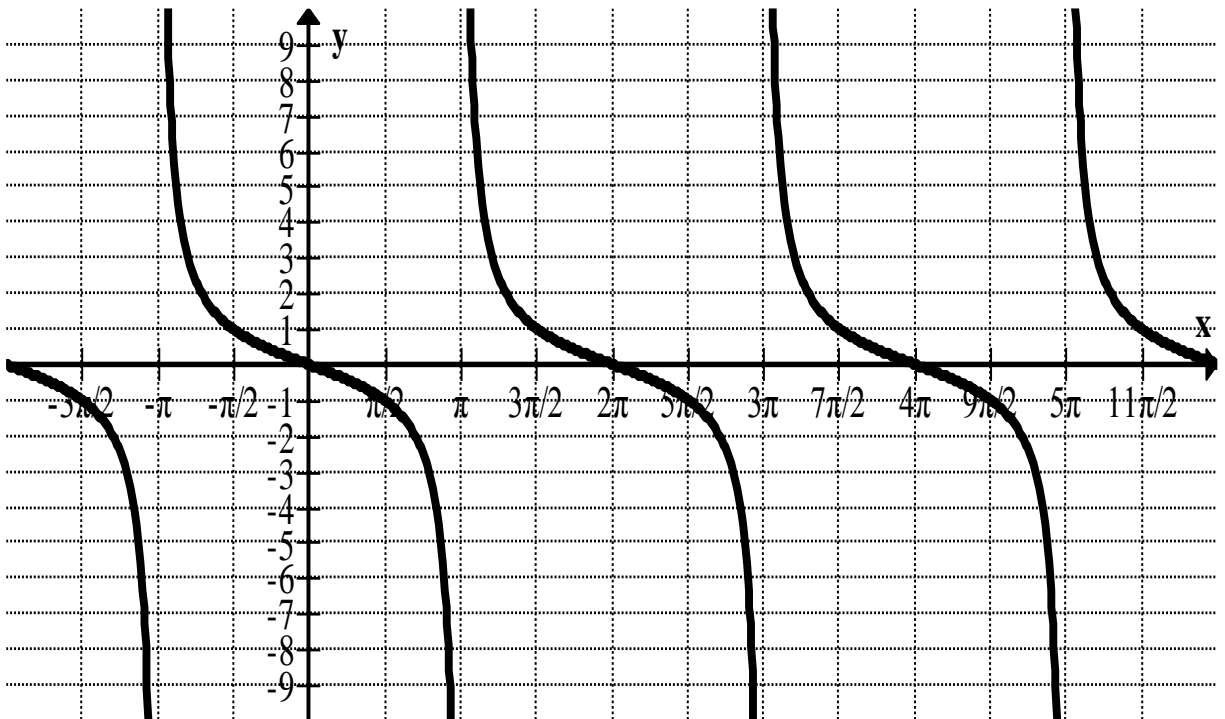
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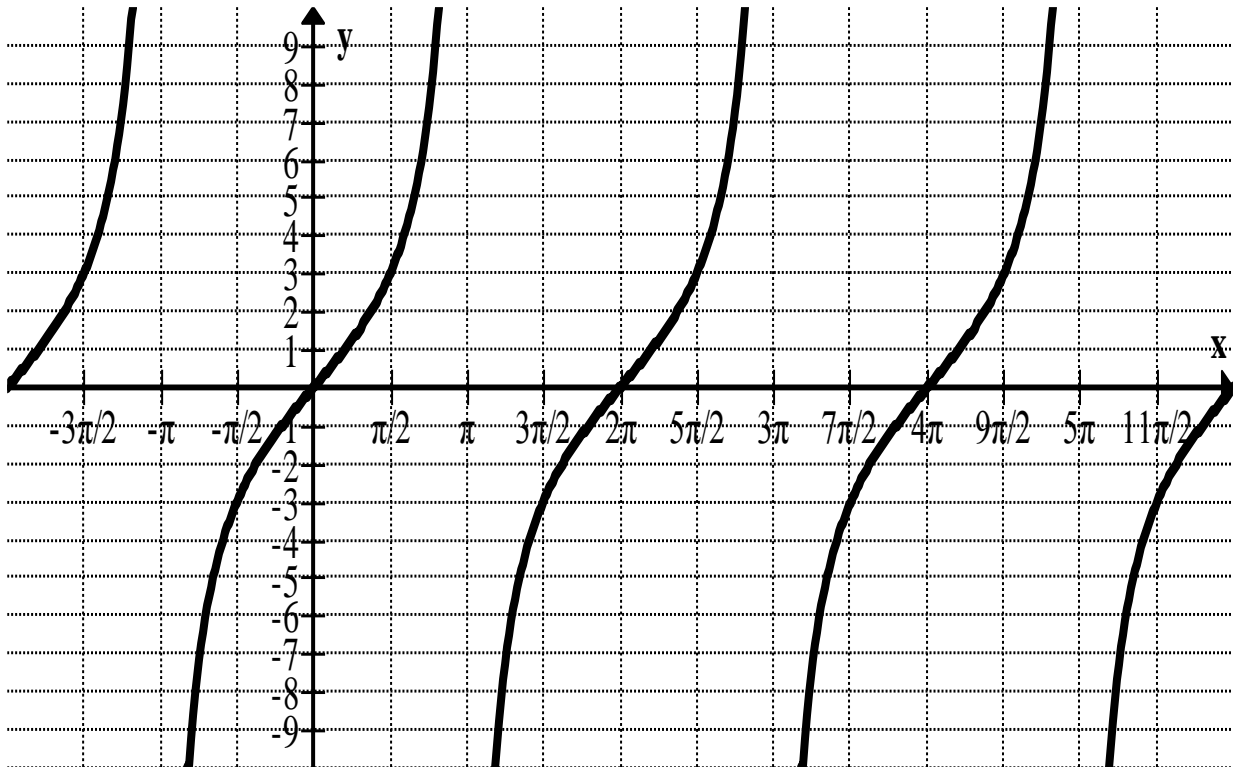
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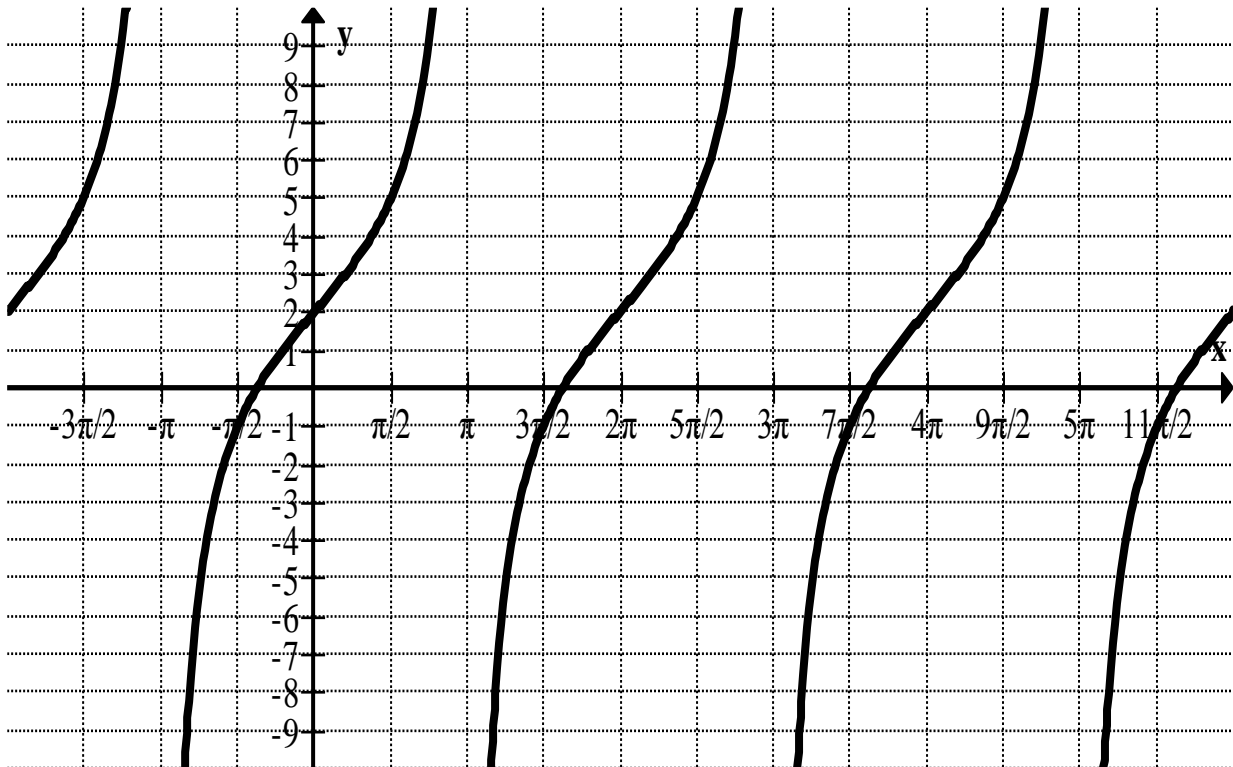
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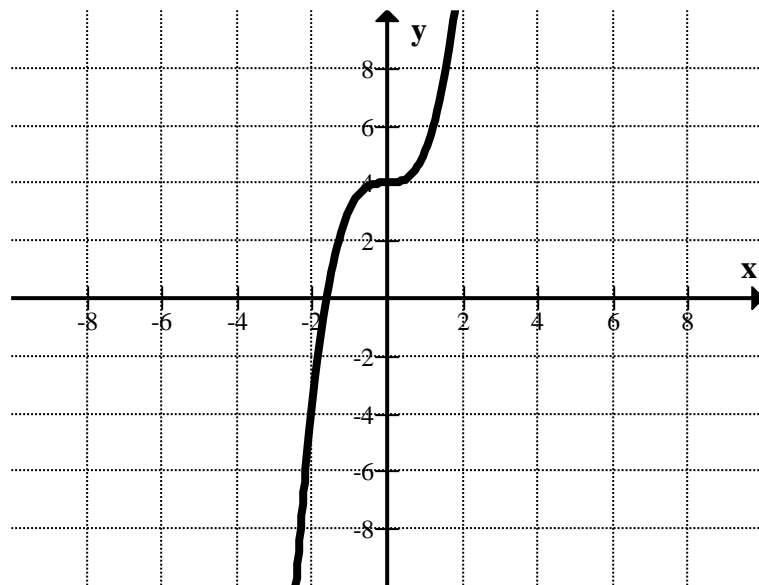
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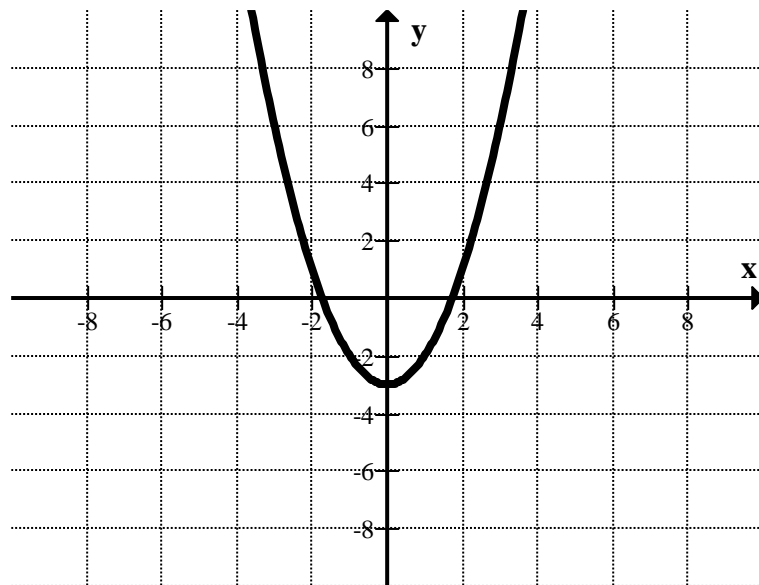
2.12 Vertical Translations

Answers

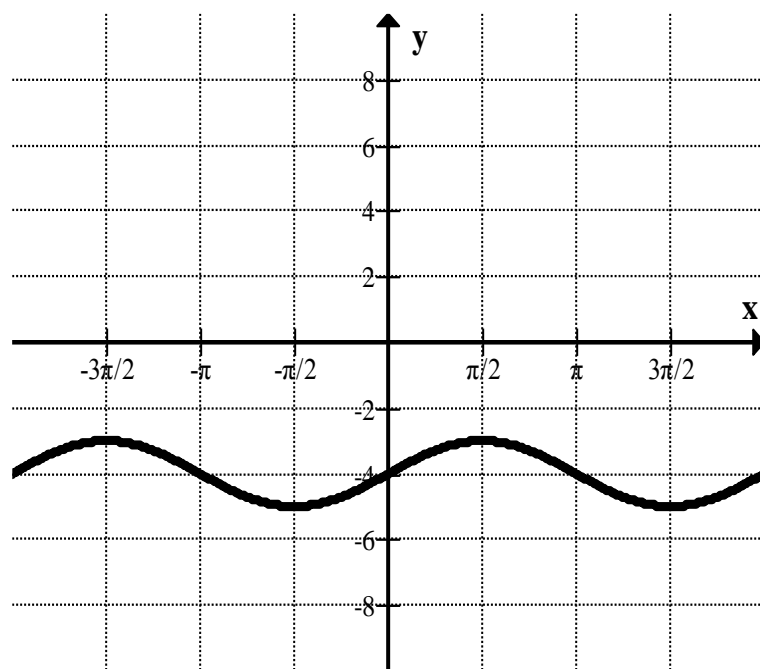
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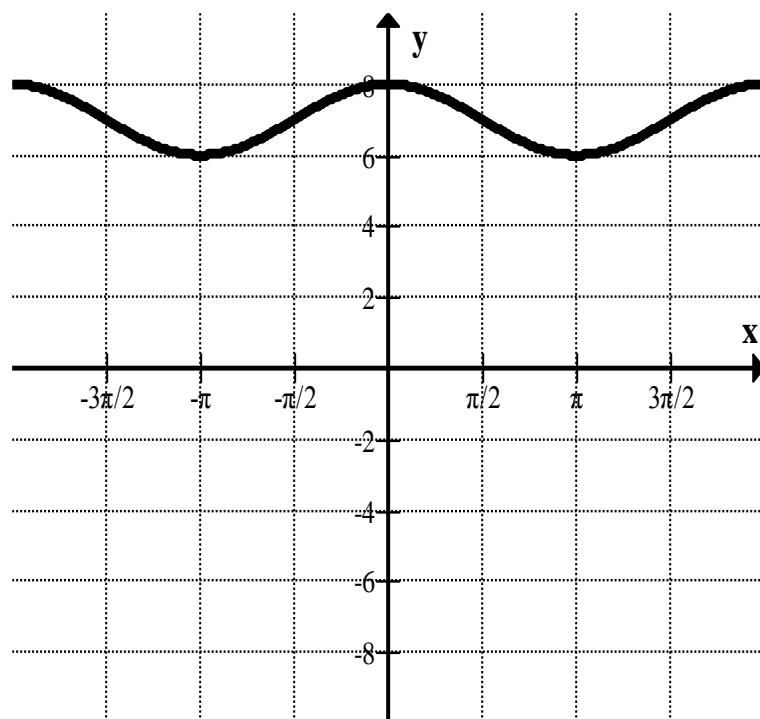
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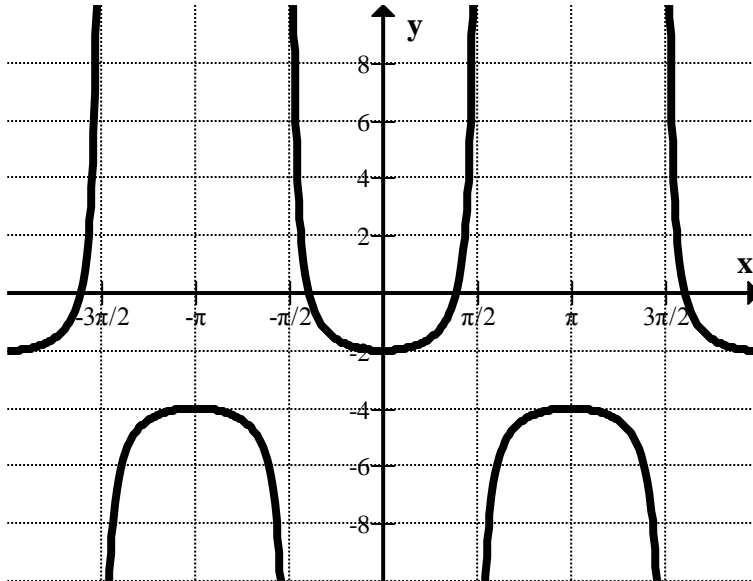
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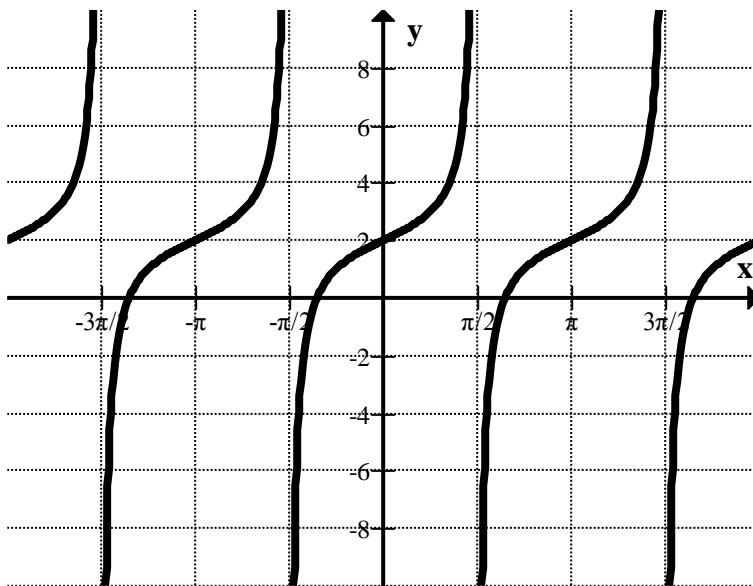
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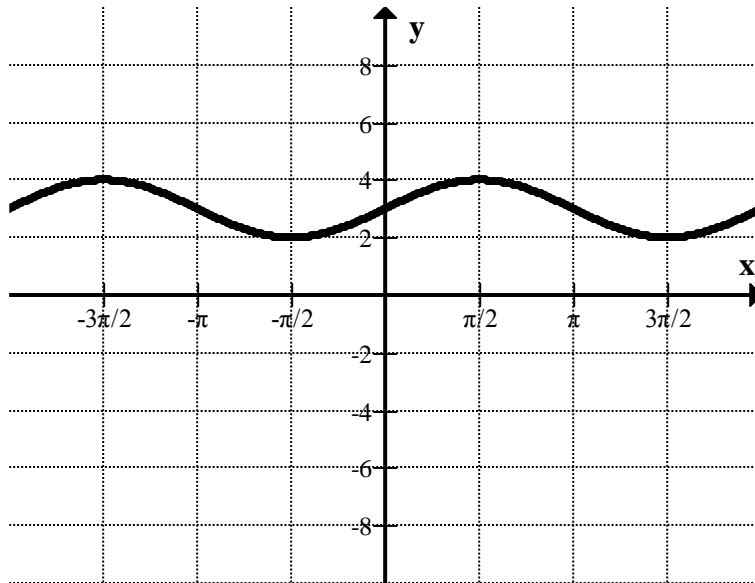
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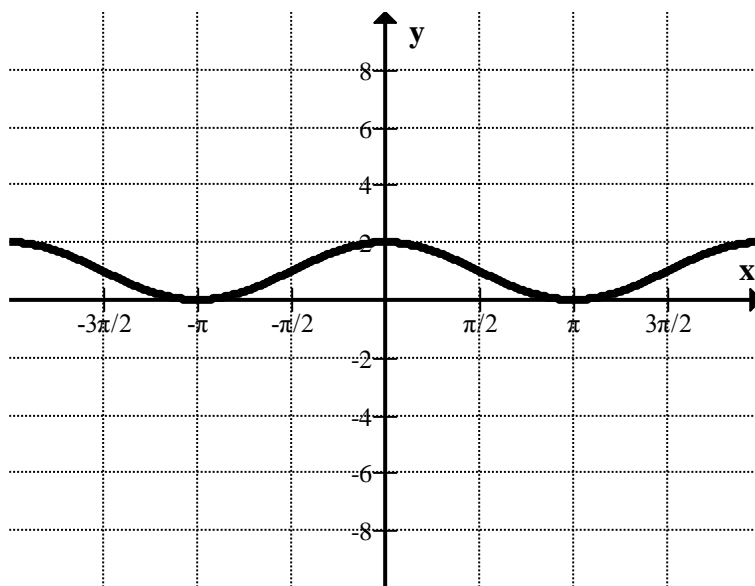
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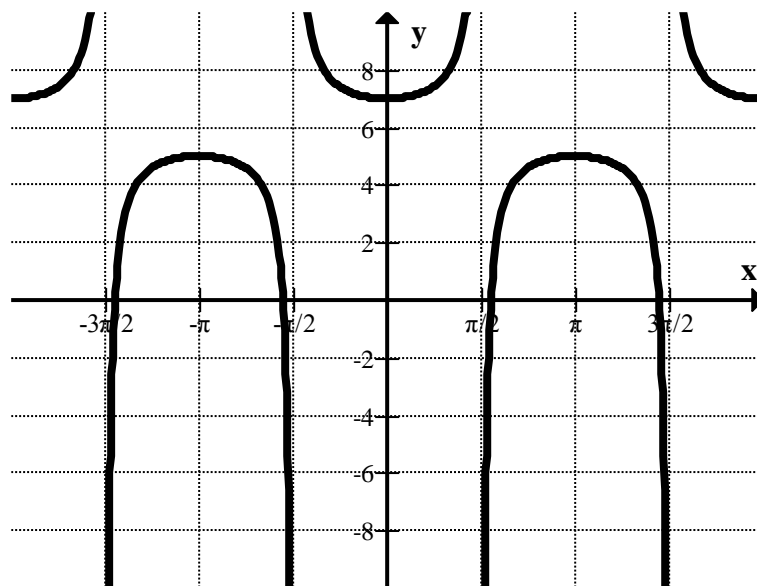
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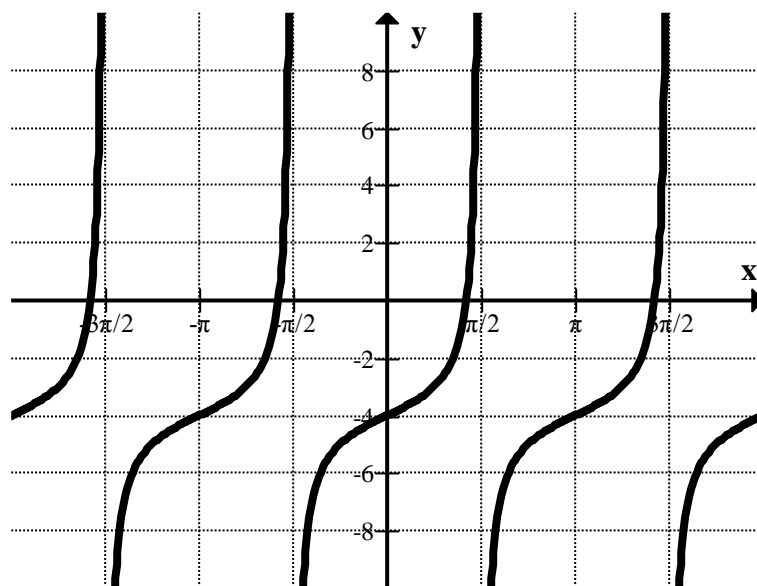
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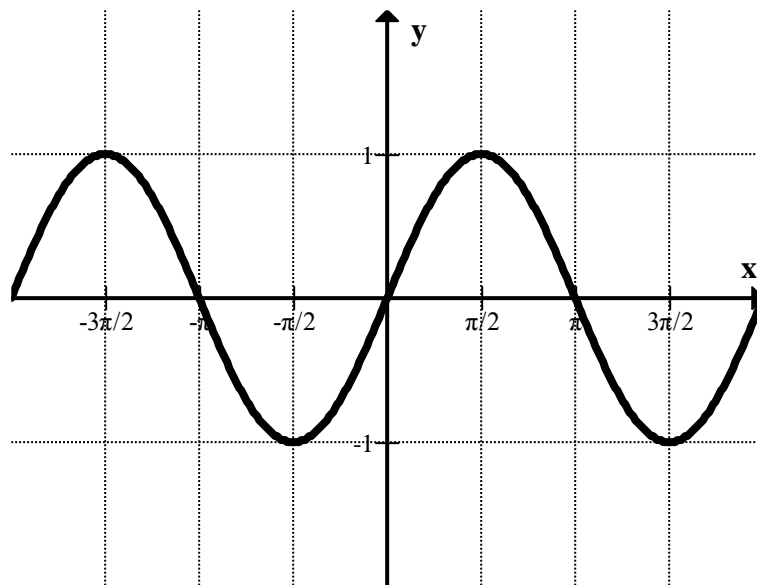


- 11. Minimum: 5; Maximum: 7
- 12. Minimum: -2; Maximum: 0
- 13. Minimum: -5; Maximum: -3
- 14. Minimum: -4; Maximum: -2
- 15. Minimum: 1; Maximum: 3
- 16. Possible answer: $y = \sin x + 6$
- 17. Possible answer: $y = \cos x - 2$
- 18. Possible answer: $y = \sin x + 1$

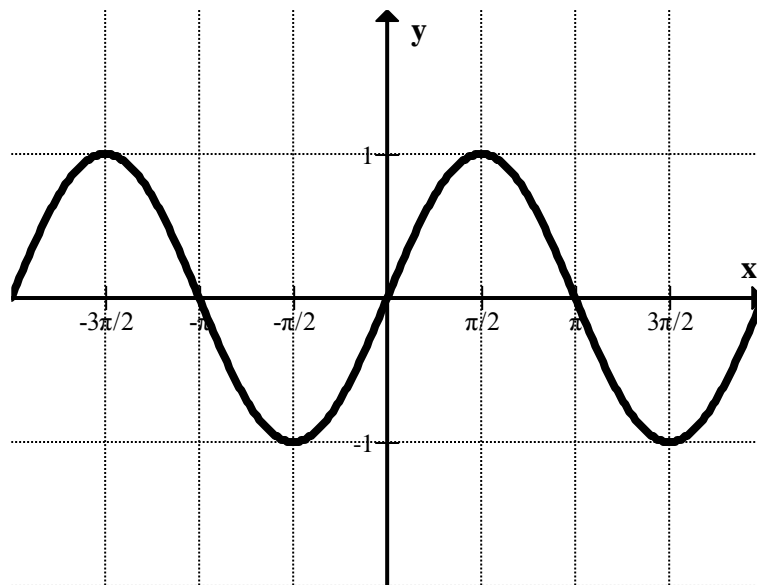
2.13 Horizontal Translations or Phase Shifts

Answers

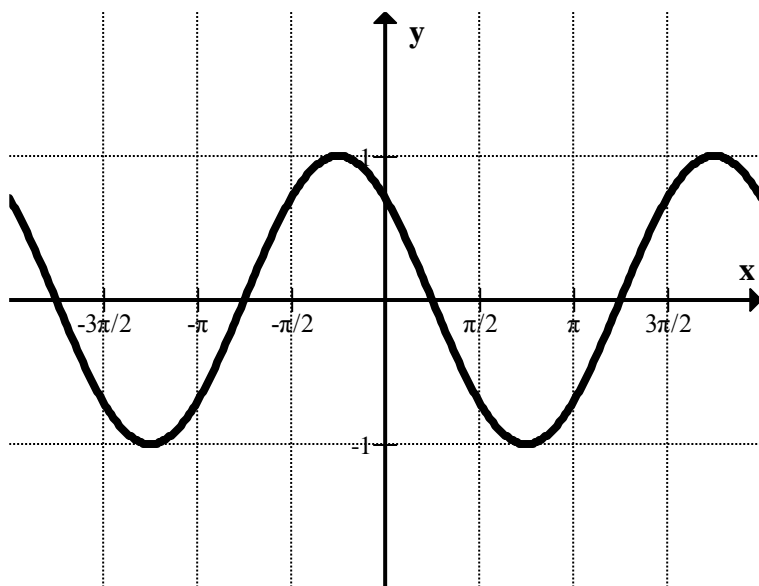
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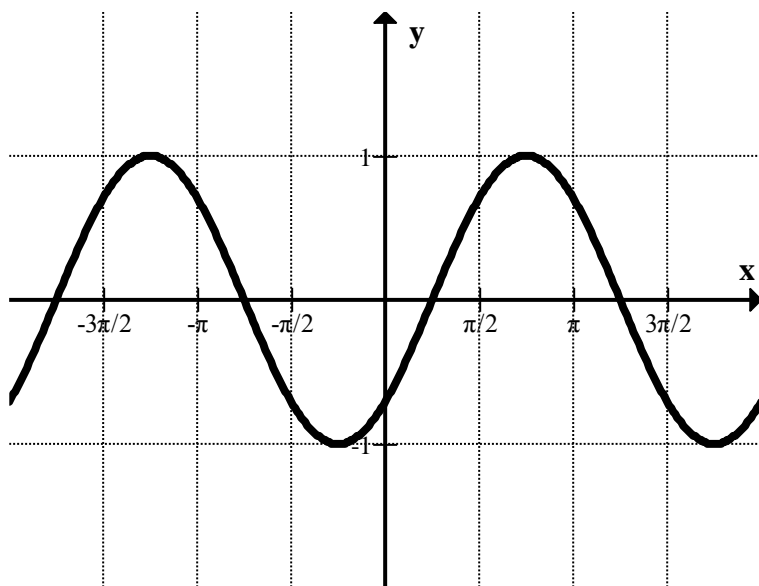
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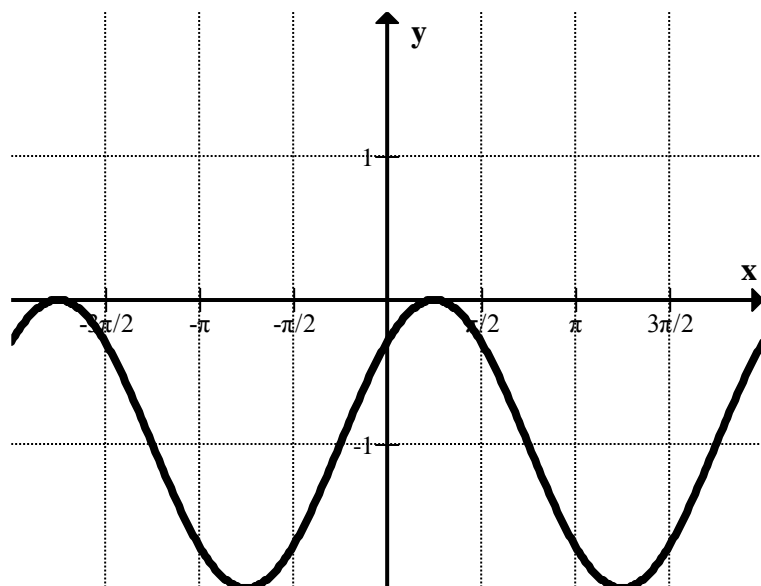
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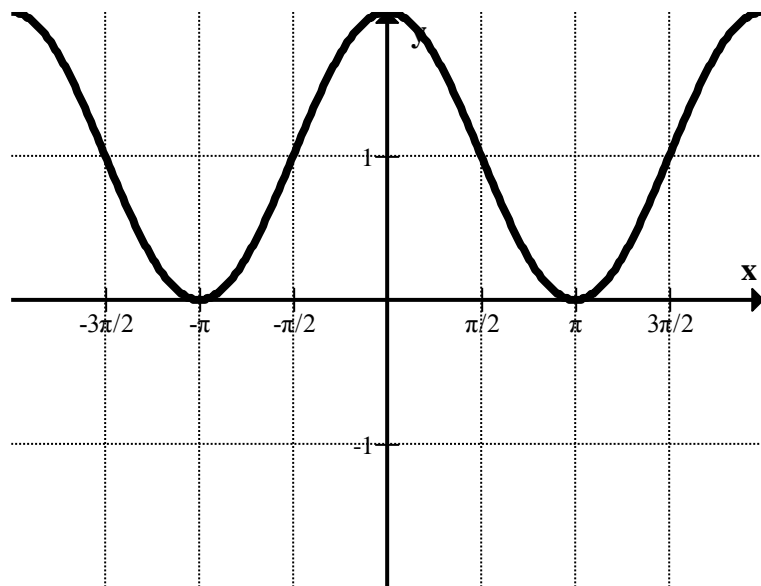
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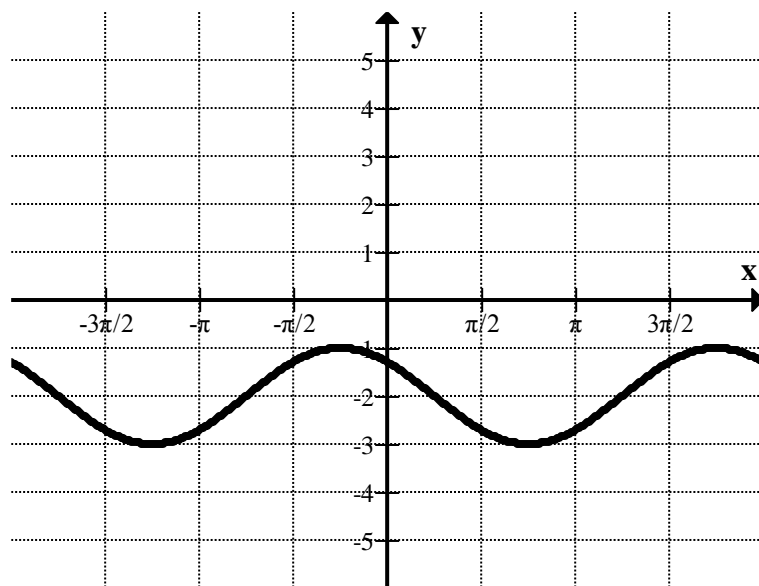
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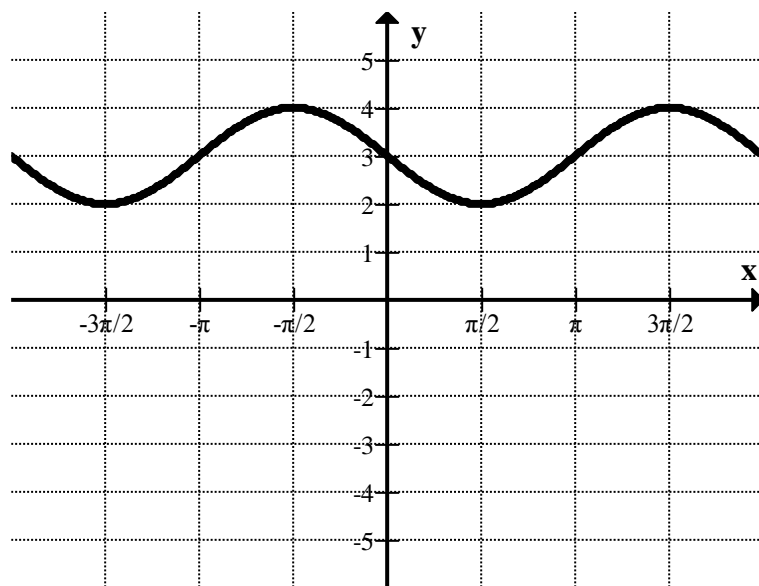
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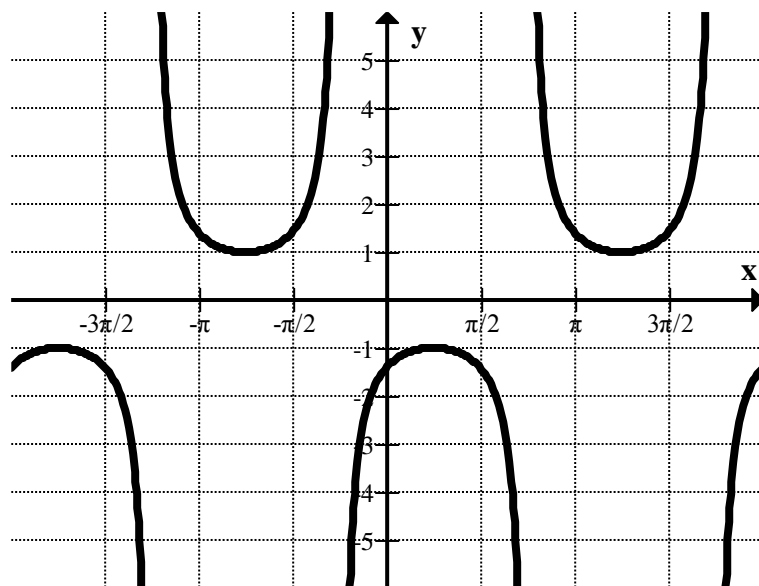
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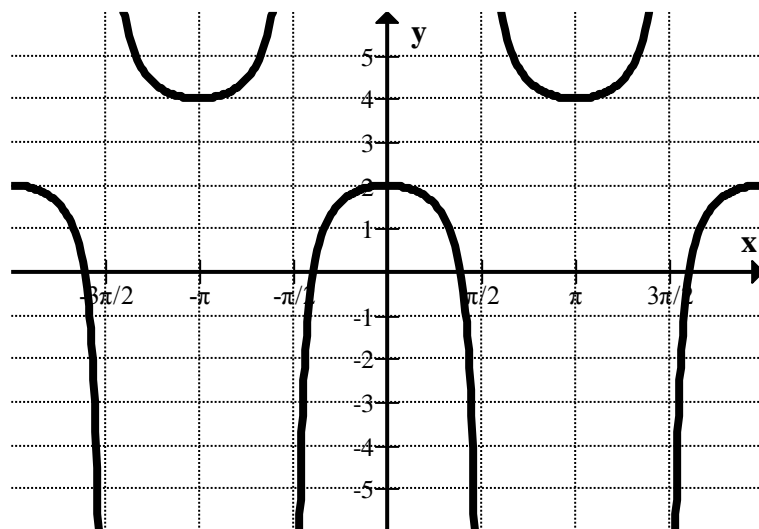
8.



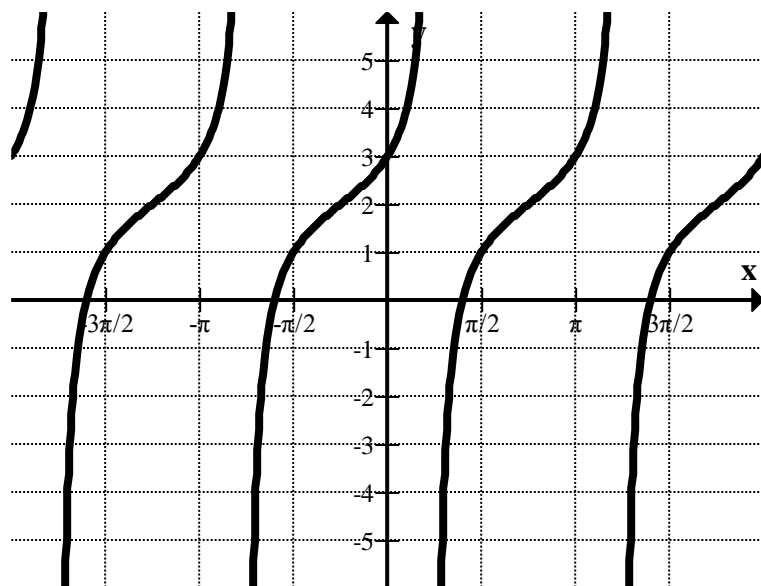
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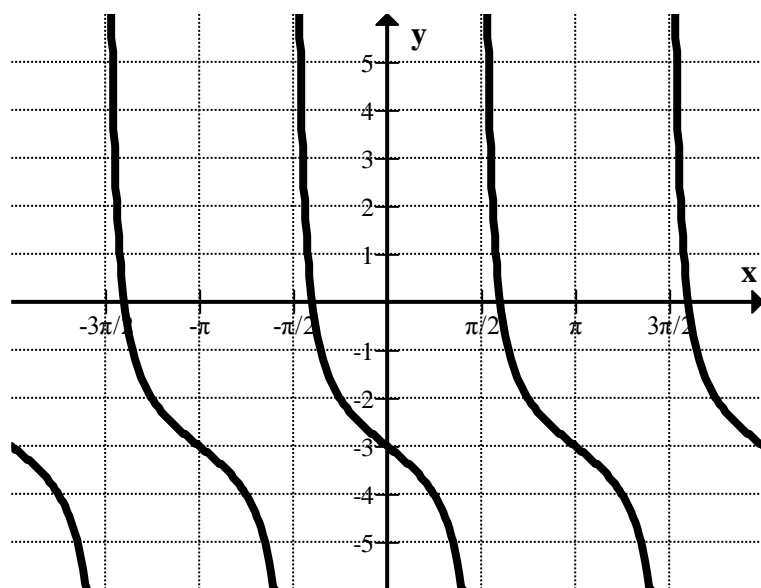
10.



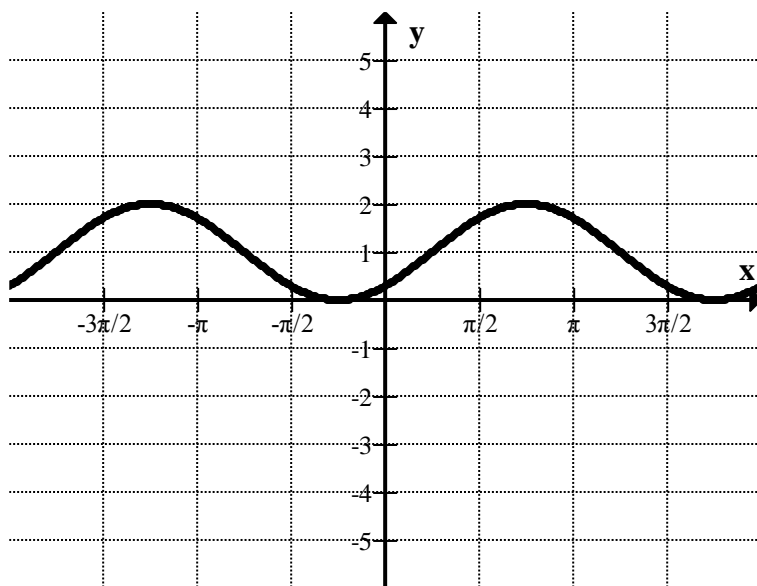
11.



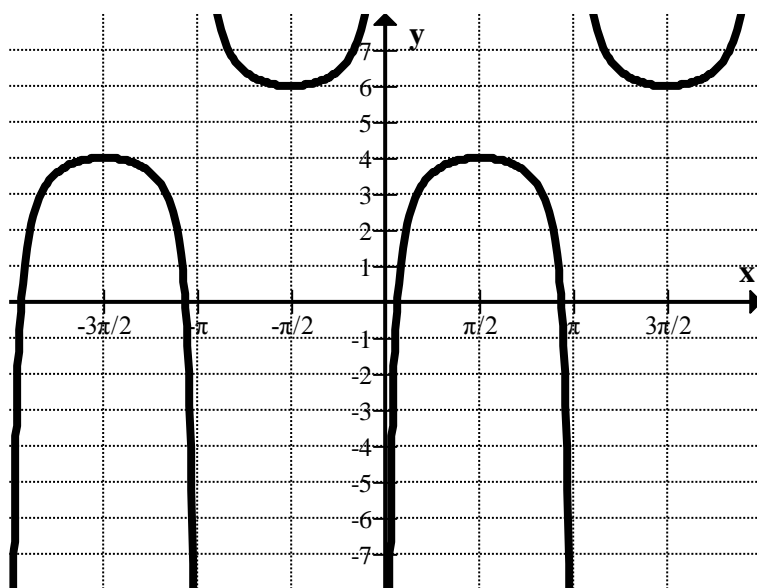
12.



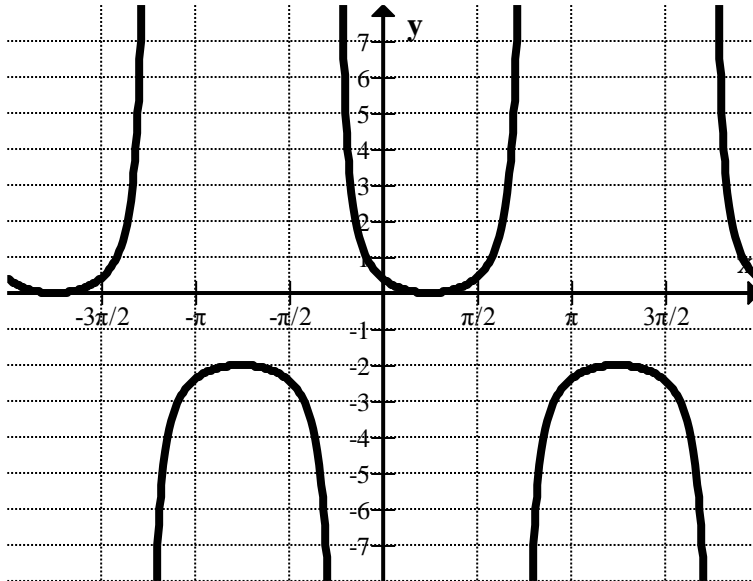
13.



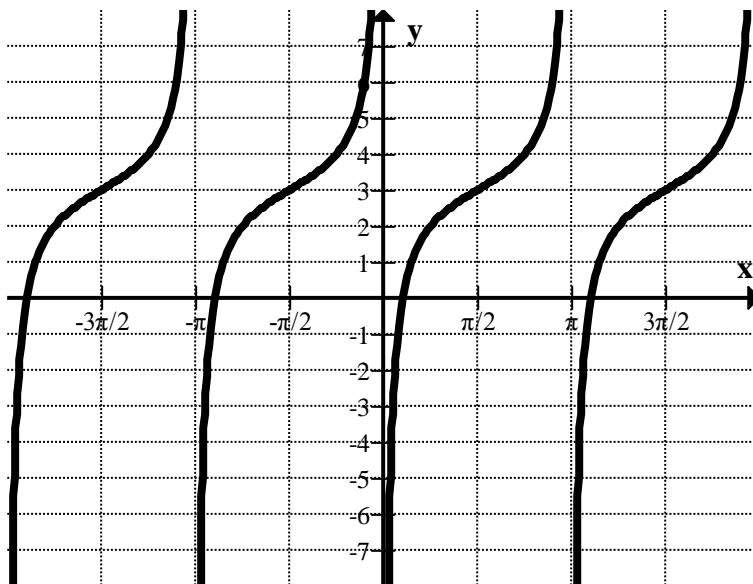
14.



15.



16.



2.14 Amplitude

Answers

1. 3

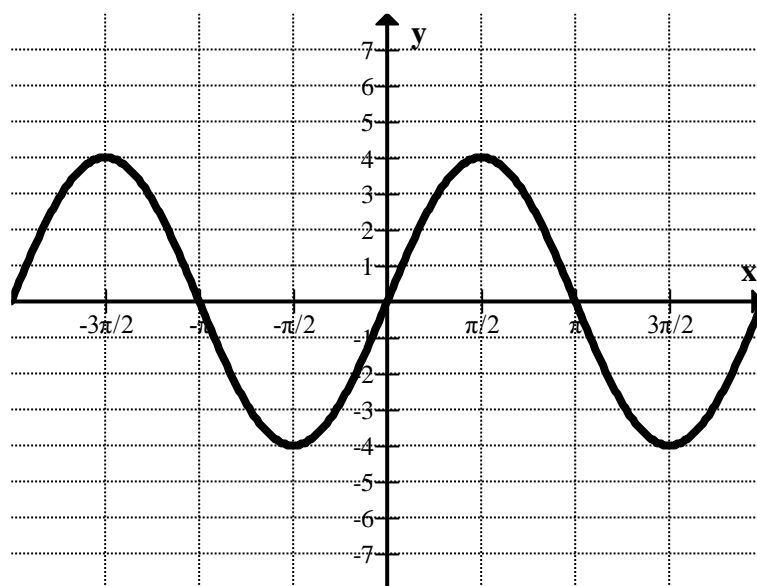
2. -2

3. 2

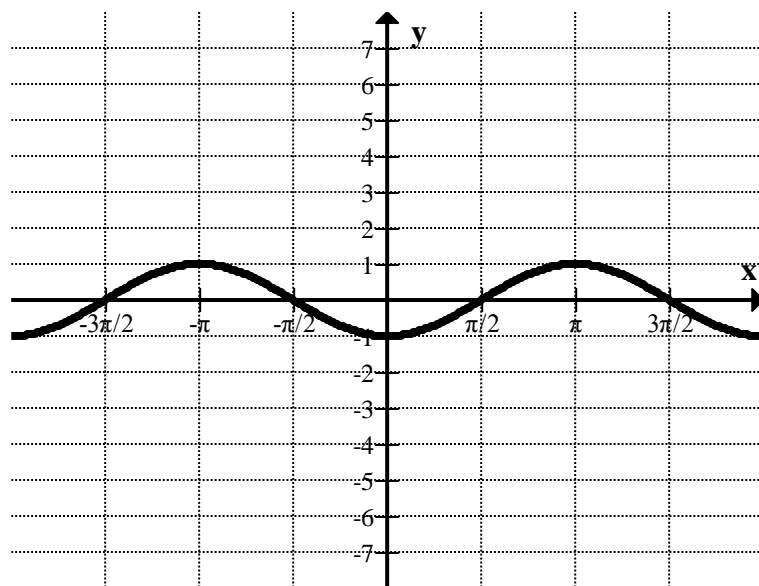
4. $\frac{2}{3}$

5. 1

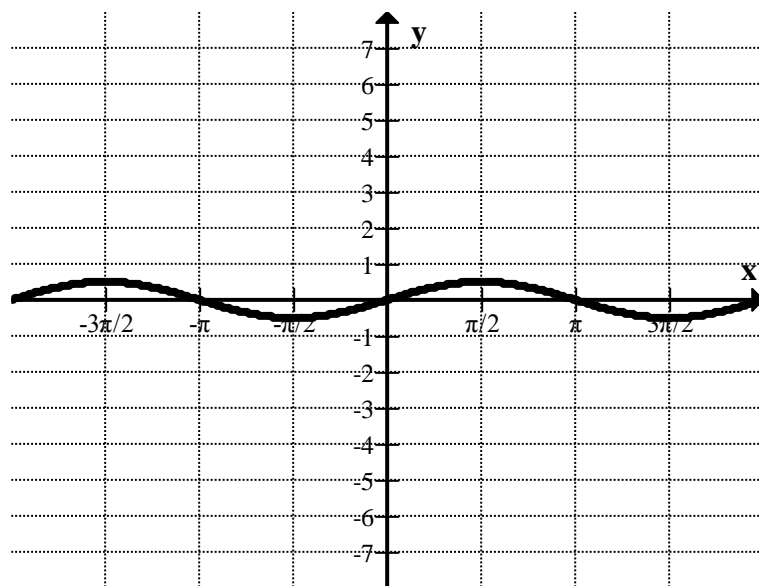
6.



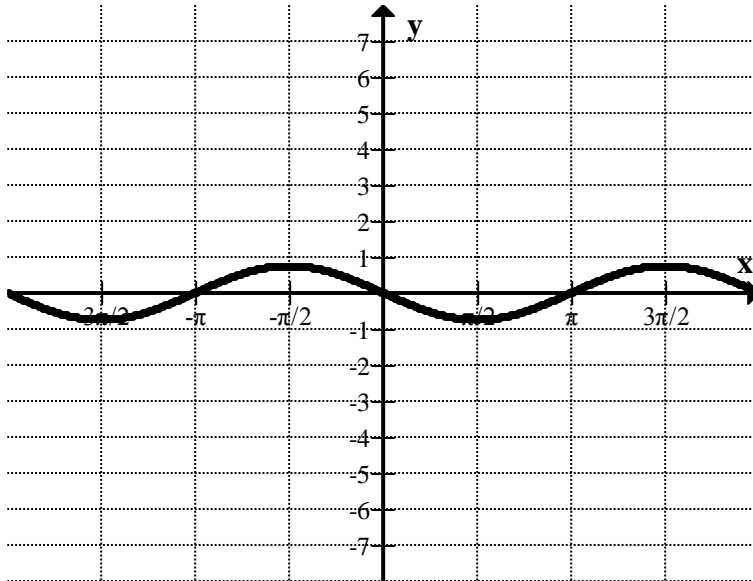
7.



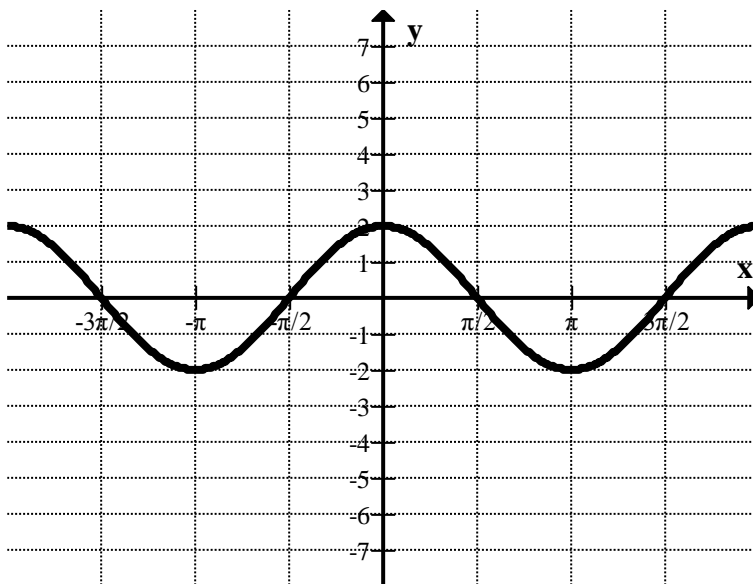
8.



9.



10.



11. Minimum: -5; Maximum: 5

12. Minimum: -1; Maximum: 1

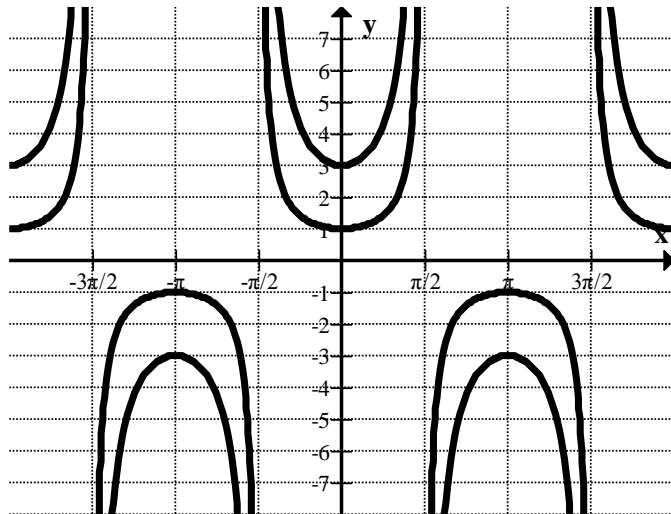
13. Minimum: -1; Maximum: 3

14. Minimum: $-\frac{11}{3}$; Maximum: $-\frac{7}{3}$

15. Minimum: 0; Maximum: 4

16. As k increase, the slope of each portion of the graph increases. If k is negative, the graph is reflected across the x -axis.

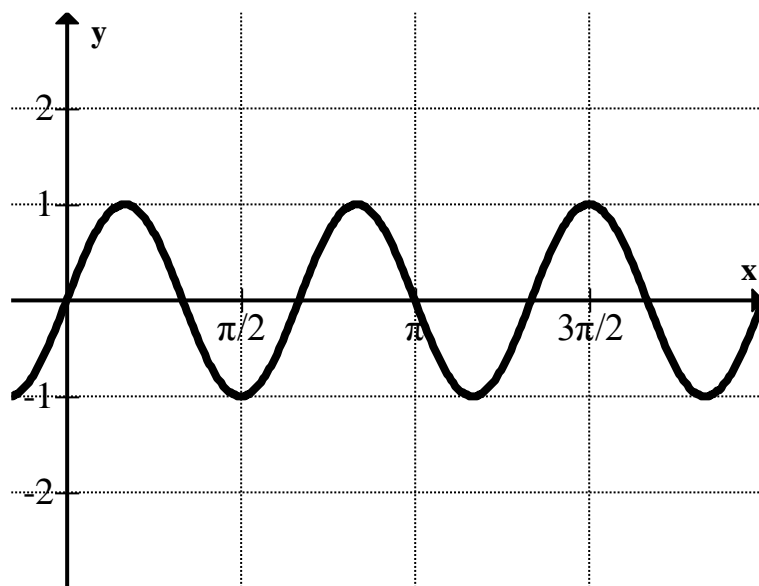
17. As k increases, the space between the top graphs and bottom graphs increases. For example, below is $y = \sec(x)$ and $y = 3 \sec(x)$.



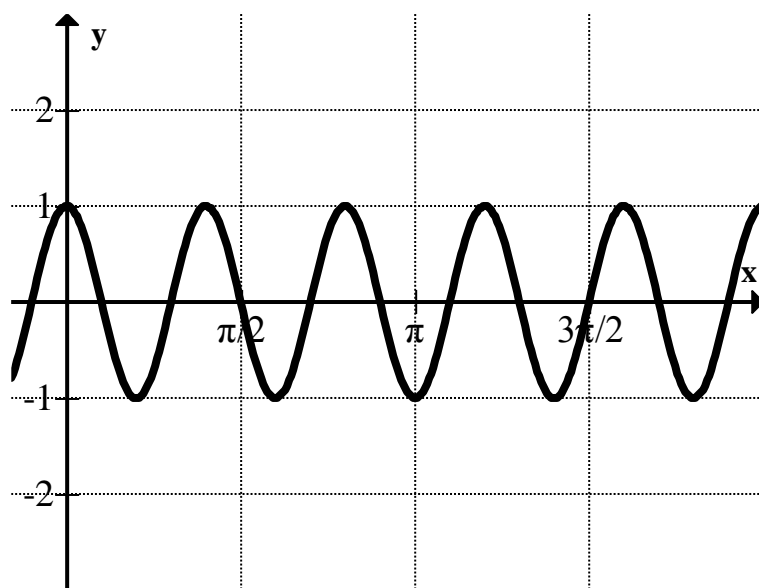
2.15 Period and Frequency

Answers

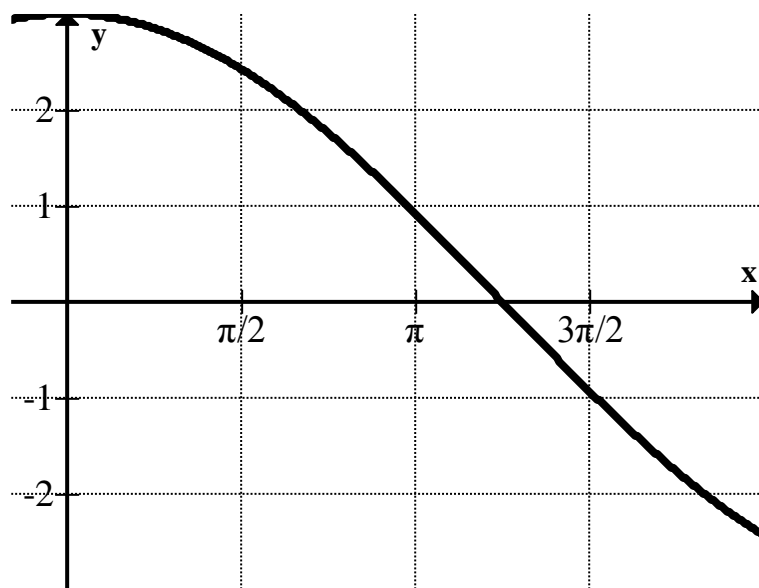
1. Frequency: 4; Period: $\frac{\pi}{2}$
2. Frequency: 2; Period: π
3. Frequency: $\frac{1}{2}$; Period: 4π
4. Frequency: $\frac{3}{4}$; Period: $\frac{8\pi}{3}$
5. Frequency: 3; Period: $\frac{2\pi}{3}$
- 6.



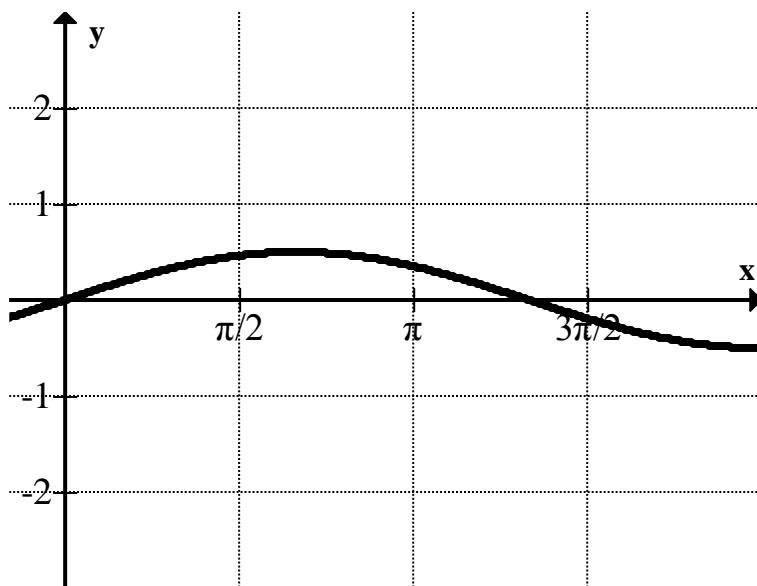
7.



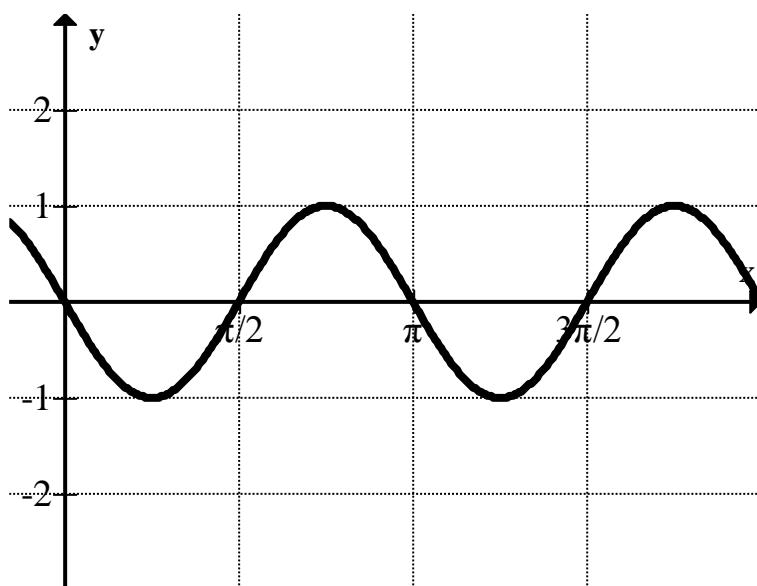
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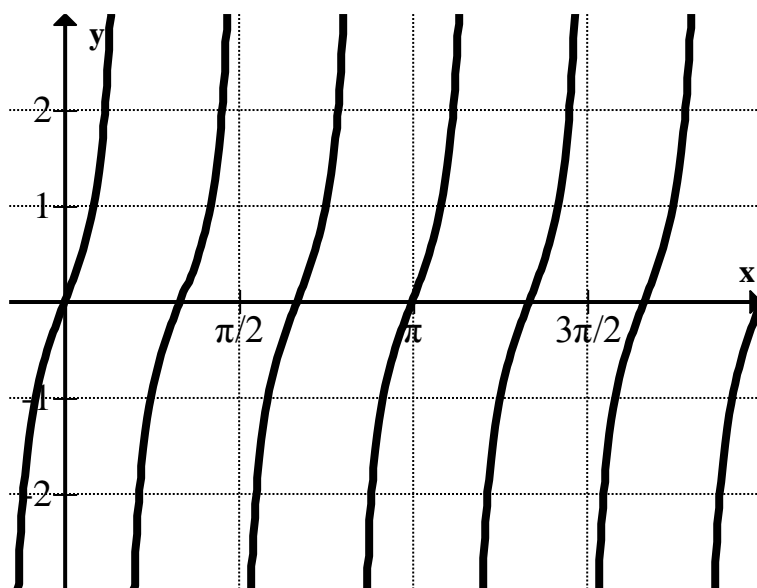
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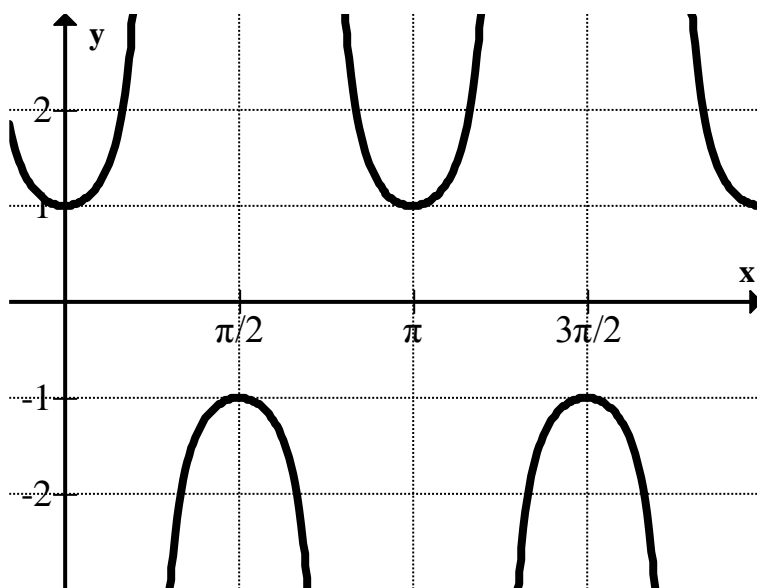
10.



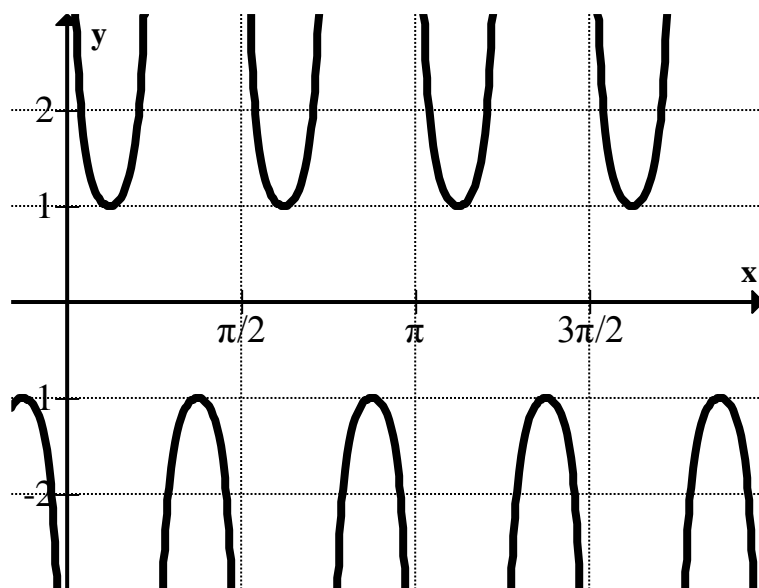
11.



12.



13.



14. $y = \cos(4x)$

15. $y = \tan(3x)$

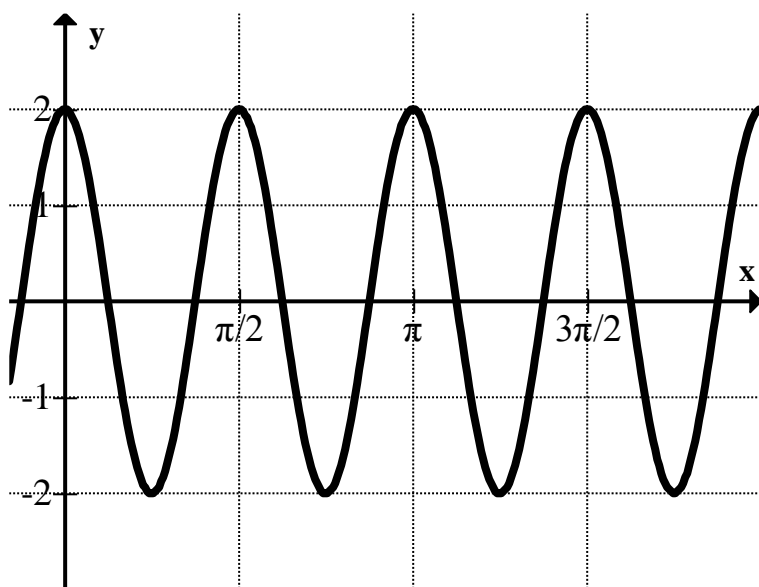
16. $y = \sin\left(\frac{1}{2}x\right)$

17. $y = \cos(2x)$

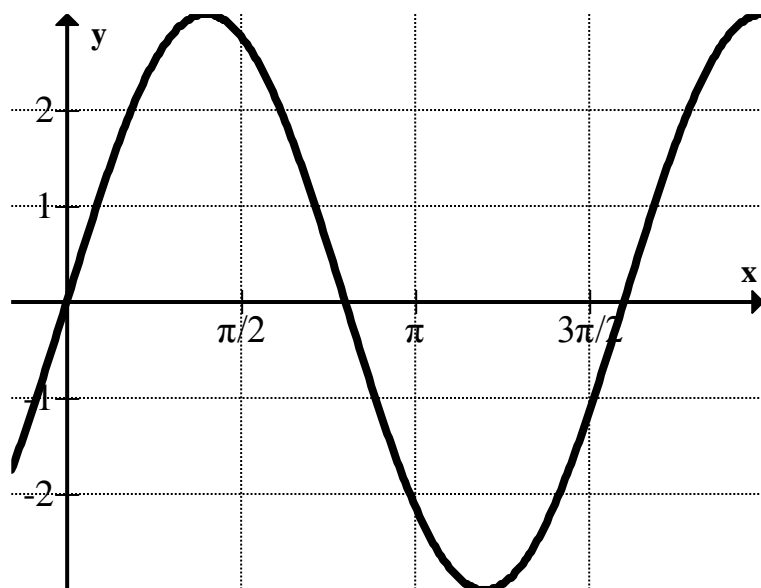
2.16 Amplitude and Period

Answers

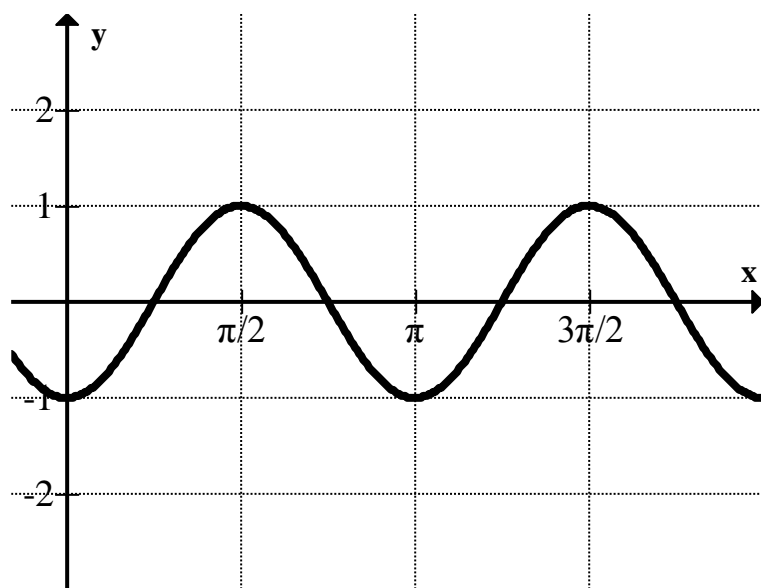
1. Amplitude: 2; Frequency: 3; Period: $\frac{2\pi}{3}$
2. Amplitude: 5; Frequency: $\frac{3}{4}$; Period: $\frac{8\pi}{3}$
3. Amplitude: 3; Frequency: 2; Period: π
4. Amplitude: 2; Frequency: $\frac{1}{2}$; Period: 4π
5. Amplitude: 1; Frequency: 2; Period: π
6. Amplitude: $\frac{1}{2}$; Frequency: 4; Period: $\frac{\pi}{2}$
7. $y = 3 \cos(2x)$
8. $y = \frac{1}{2} \sin(4x)$
9. $y = \frac{2}{3} \cos(x)$
10. $y = 2 \sin\left(\frac{1}{2}x\right)$
- 11.



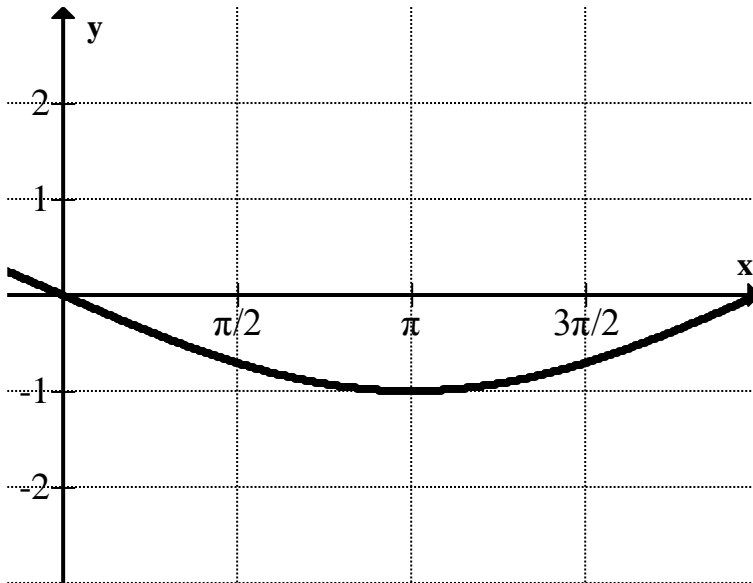
12.



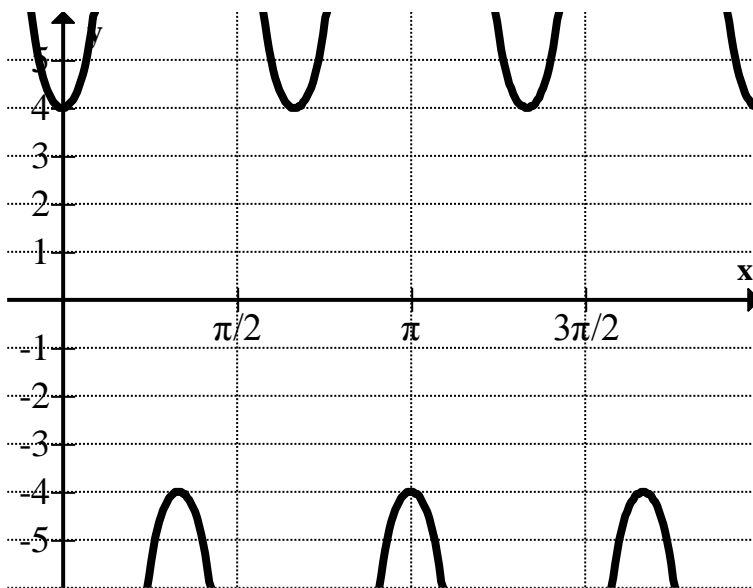
13.



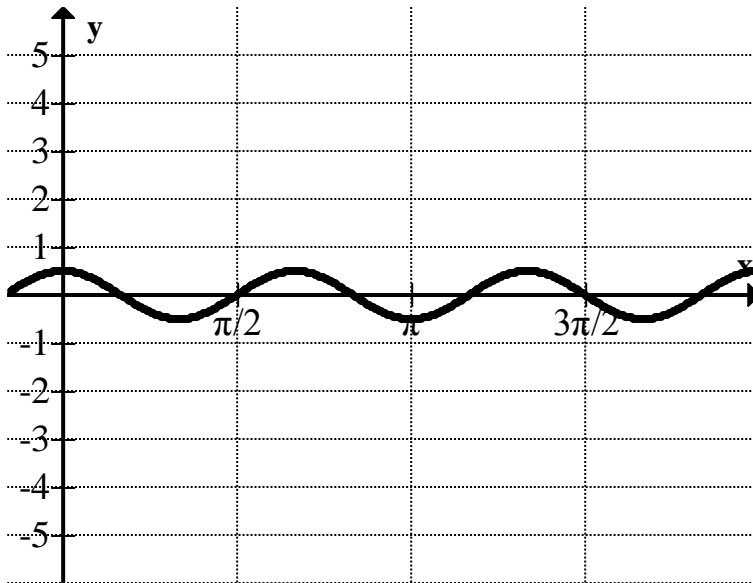
14.



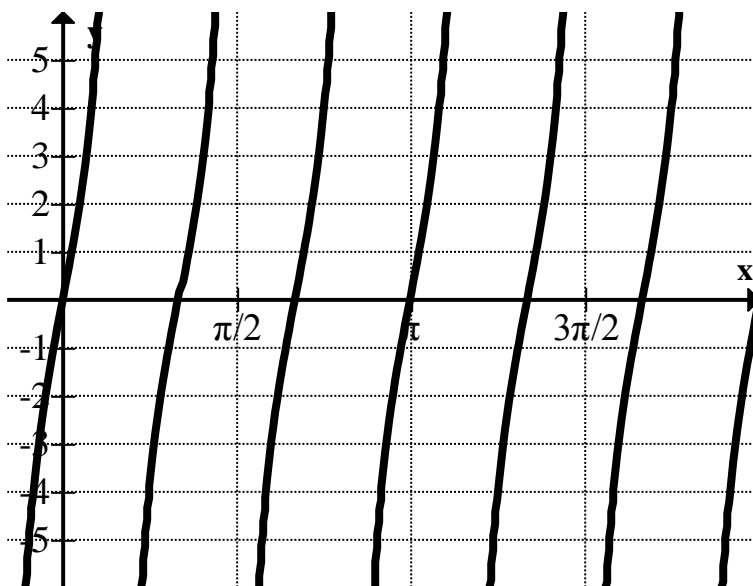
15.



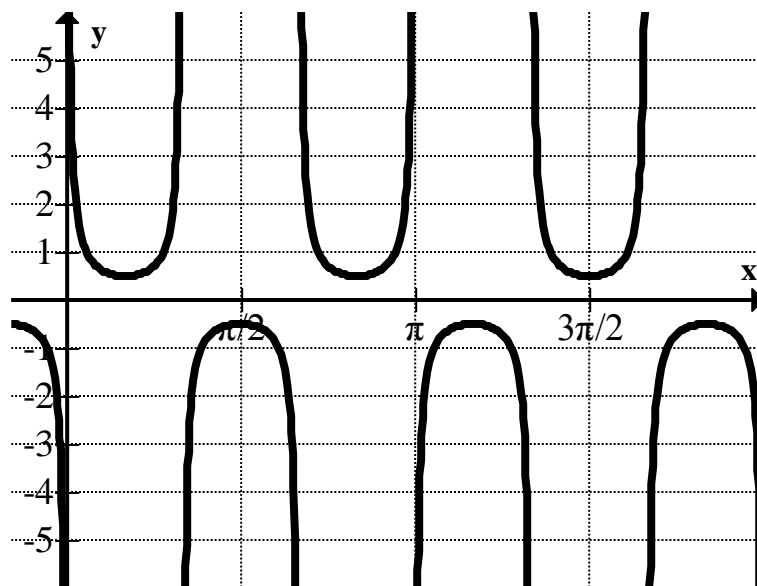
16.



17.



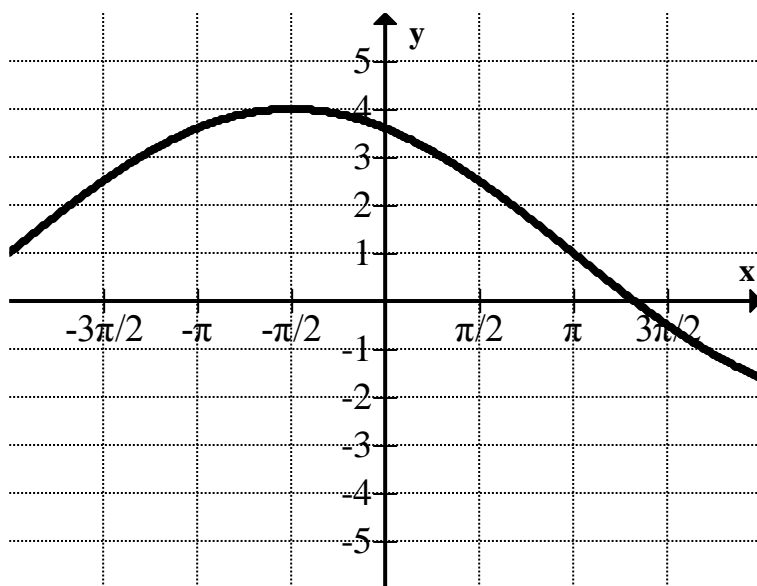
18.



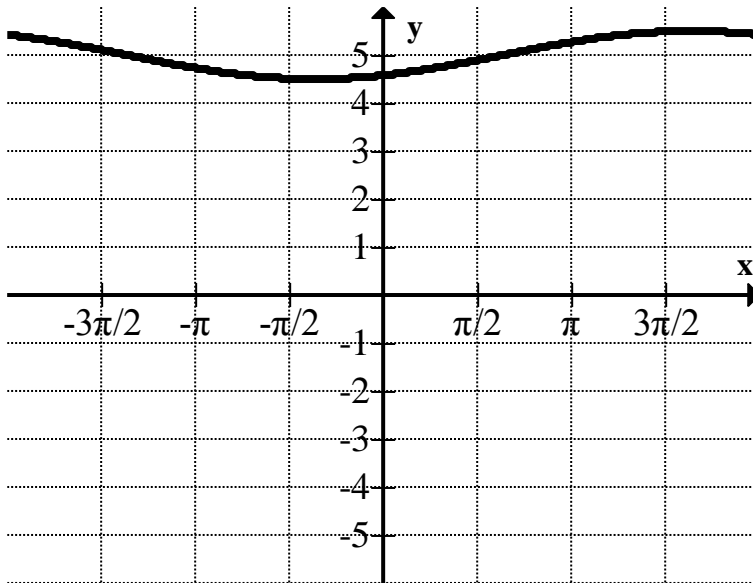
2.17 Trigonometric Identities and Equations

Answers

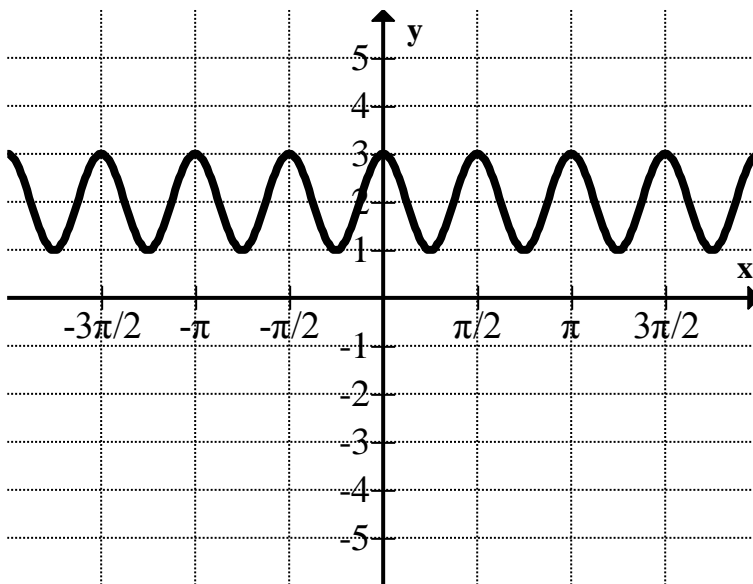
1. Amplitude: 4; Frequency: $\frac{2}{3}$; Period: 3π ; Horizontal shift 3 to the right; Vertical shift 2 up
2. Amplitude: $\frac{1}{2}4$; Frequency: $\frac{1}{2}$; Period: 4π ; Horizontal shift π to the right; Vertical shift 3 up
3. Amplitude: 5; Frequency: 4; Period: $\frac{\pi}{2}$; Horizontal shift $\frac{\pi}{2}$ to the left; Vertical shift 1 up
4. Amplitude: 1; Frequency: 2; Period: π ; Horizontal shift 1 to the left; Vertical shift 4 up
5. Amplitude: 2; Frequency: 1; Period: 2π ; Horizontal shift 4 to the right; Vertical shift 3 up
- 6.



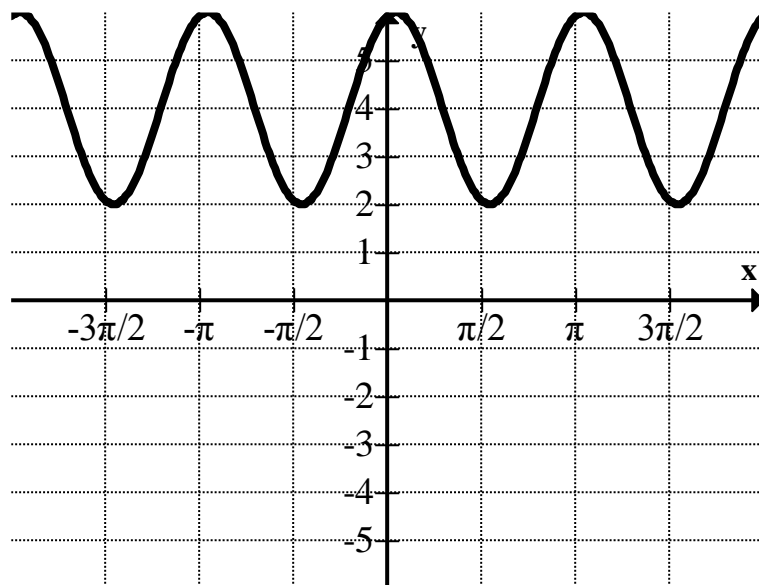
7.



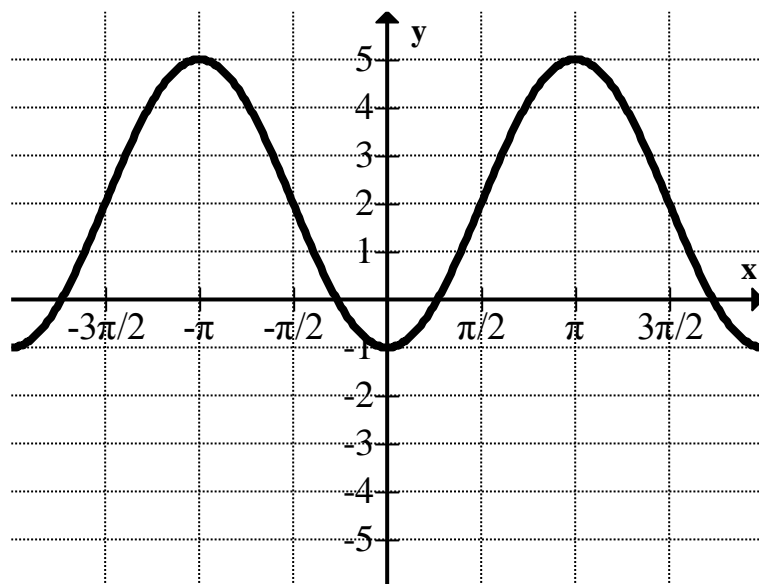
8.



9.



10.



11. Possible equation: $y = 2 + 3 \sin\left(\frac{1}{2}(x - \pi)\right)$

12. Possible equation: $y = -1 - \cos\left(2\left(x - \frac{\pi}{2}\right)\right)$

13. Possible equation: $y = 4 - 2 \cos\left(3\left(x - \frac{3\pi}{2}\right)\right)$

14. Possible equation: $y = 2 \sin\left(4\left(x - \frac{\pi}{2}\right)\right) - 3$

15. Possible equation: $y = 3 \csc(2(x - \pi)) + 1$