

Conic Sections

Multiple Choice - Choose the best answer for each question.

- State the vertex of the parabola whose equation is $(y - 9)^2 = -4(x - 2)$.

a. (9, -2) b. (-2, 2) c. (2, -2) **d. (2, 9)**
- Rewrite the following equation in standard form: $2y^2 + 12y - x + 2 = 0$.

a. $(y + 6)^2 = \frac{1}{2}(x - 2)$ b. $(y + 3)^2 = \frac{1}{2}(x + 7)$
 c. $(y + 3)^2 = \frac{1}{2}(x + 10)$ **d. $(y + 3)^2 = \frac{1}{2}(x + 16)$**

$2y^2 + 12y = x - 2$
 $2(y^2 + 6y) = x - 2$
 $2(y^2 + 6y + 9) = x - 2 + 18$
 $2(y + 3)^2 = \frac{x + 16}{2}$
 $(y + 3)^2 = \frac{1}{2}(x + 16)$
- Identify the focus of $(y - 3)^2 = -8(x - 2)$.

a. (0, 3) b. (4, 3) c. (2, 1) d. (2, 5)

$4p = -8$
 $p = -2$ opens left
 Vertex (2, 3)
- Identify the type of conic section from the equation: $y^2 - 4y - x^2 + 6x = 12$.

a. Circle b. Ellipse c. Parabola **d. Hyperbola**

$y^2 - 4y + 4 - (x^2 - 6x + 9) = 12 + 4 - 9$
 $\frac{(y - 2)^2}{2^2} - \frac{(x - 3)^2}{2^2} = \frac{25}{25}$
 $\frac{(y - 2)^2}{25} - \frac{(x - 3)^2}{25} = 1$
- Write the equation of the parabola with vertex (4, -2) and focus (4, 4).

a. $(x - 4)^2 = 16(y + 2)$ b. $(y + 2)^2 = 8(x - 4)$
c. $(x - 4)^2 = 24(y + 2)$ d. $(y + 2)^2 = 12(x - 4)$

$4p = 4(6) = 24$
- What are the center and radius of the circle, $(x - 7)^2 + (y + 6)^2 = 4$?

a. C: (-7, 6); r = 4 b. C: (7, -6); r = 16 c. C: (-7, 6); r = 8 **d. C: (7, -6); r = 2**

$r^2 = 4$ $r = 2$
- Write the equation of the circle with a diameter with endpoints (6, 12) and (16, -8).

a. $(x - 11)^2 + (y - 6)^2 = 125$ distance from center
c. $(x - 11)^2 + (y - 2)^2 = 125$ to endpoint
 $d = \sqrt{(4 - 6)^2 + (2 - 12)^2}$
 center $(\frac{x+x}{2}, \frac{y+y}{2}) = (\frac{6+16}{2}, \frac{12-8}{2})$
center = (11, 2)
- Identify the center and foci of the ellipse, $\frac{(x+4)^2}{16} + \frac{(y-1)^2}{36} = 1$.

a. Center: (-4, 1); Foci: $(-4 \pm 2\sqrt{5}, 1)$
c. Center: (-4, 1); Foci: $(-4, 1 \pm 2\sqrt{5})$
 b. Center: (4, -1); Foci: $(4 \pm 2\sqrt{5}, -1)$
 d. Center: (4, -1); Foci: $(4, -1 \pm 2\sqrt{5})$

radius = $a = \sqrt{36}$
 $c^2 = a^2 - b^2$
 $c^2 = 36 - 16$
 $c^2 = 20$
 $c = \sqrt{20} = 2\sqrt{5}$
- State the length of the major and minor axes of $\frac{(x+4)^2}{16} + \frac{(y-1)^2}{36} = 1$.

a. Major: 4 Minor: 6 b. Major: 6 Minor: 4 c. Major: 36 Minor: 16 **d. Major: 12 Minor: 8**

$a = 6$ $b = 4$
 $2a = 12$ $2b = 8$
- What is the slope of the asymptotes for the hyperbola: $\frac{(y+4)^2}{16} - \frac{(x+2)^2}{8} = 1$.

a. $m = \pm 2$ b. $m = \pm \frac{1}{2}$ c. $m = \pm \frac{\sqrt{2}}{2}$ **d. $m = \pm \sqrt{2}$**

$a = \sqrt{16} = 4$ $b = \sqrt{8} = 2\sqrt{2}$
 $m = \frac{a}{b} = \frac{4}{2\sqrt{2}} = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$
- Identify the type of conic section from the equation: $4y^2 + 16y + 4x^2 - 24y = 12$.

a. Circle b. Ellipse c. Parabola d. Hyperbola

$4y^2 - 8y + 4x^2 = 12$
 $4(y^2 - 2y + 1) + 4x^2 = 12$
 $4(y - 1)^2 + 4x^2 = 12$
 $\frac{(y - 1)^2}{3} + \frac{x^2}{3} = 1$
 $x^2 + (y - 1)^2 = 3$
- What is the solution of the system of equations?

a. (0, -3) b. (-1, -4) c. (-3, 0) and (1, 0) **d. (-2, -3) and (2, 5)**

$y = 2x + 1$
 $2x + 1 = x^2 + 2x - 3$
 $x^2 - 4 = 0$
 $(x + 2)(x - 2) = 0$
 $x = 2$ $x = -2$
 $\frac{2(2) + 1}{5} = \frac{5}{5} = 1$ $\frac{2(-2) + 1}{-3} = \frac{-3}{-3} = 1$

Multiple Choice – Choose the best answer for each question.

1. Find $7A + 6B$.

$$A = \begin{bmatrix} 1 & -1 \\ 0 & -3 \\ 5 & 2 \end{bmatrix}$$

$$B = \begin{bmatrix} -2 & 1 \\ 5 & 4 \\ 0 & -7 \end{bmatrix}$$

$$\begin{bmatrix} 7 & -7 \\ 0 & -21 \\ 35 & 14 \end{bmatrix} + \begin{bmatrix} 42 & 6 \\ 30 & 24 \\ 0 & -42 \end{bmatrix}$$

a. $\begin{bmatrix} 19 & -13 \\ 30 & 3 \\ -35 & 56 \end{bmatrix}$

b. $\begin{bmatrix} -5 & -1 \\ 0 & 3 \\ 0 & -28 \end{bmatrix}$

c. $\begin{bmatrix} -5 & -1 \\ -30 & -45 \\ 35 & 56 \end{bmatrix}$

d. $\begin{bmatrix} -5 & -1 \\ 30 & 3 \\ 35 & -28 \end{bmatrix}$

2. Evaluate the determinant:

$$\begin{vmatrix} -5 & -5 & 4 \\ -5 & 4 & -1 \\ 0 & 3 & -1 \end{vmatrix}$$

$$\begin{vmatrix} -5 & -5 \\ -5 & 4 \\ 6 & 3 \end{vmatrix}$$

$$= (20 + 0 - 60) - (0 + 15 - 25) = -40 + 10 = -30$$

a. 30

b. -50

c. -30

d. -40

3. Solve using a matrix equation:

$$\begin{cases} -3x + 10y = 3 \\ x - 3y = -3 \end{cases}$$

$$\begin{bmatrix} -3 & 10 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

Determinant $9 - 10 = -1$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-1} \begin{bmatrix} -3 & -10 \\ -1 & -3 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

a. $\begin{cases} 21 & x=21 \\ 6 & y=6 \end{cases}$

b. $\begin{cases} -6 & x=-6 \\ -21 & y=-21 \end{cases}$

c. $\begin{cases} -21 & x=-21 \\ -6 & y=-6 \end{cases}$

d. no solution

Calculator $\begin{bmatrix} -3 & 10 & -1 \\ 1 & -3 & -3 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \end{bmatrix}$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 & 10 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -21 \\ -6 \end{bmatrix}$$

4. Multiply:

$$\begin{bmatrix} -7 & 6 \\ 1 & 6 \end{bmatrix} \begin{bmatrix} -4 & 1 \\ -4 & 3 \end{bmatrix} \begin{bmatrix} 4 & 11 \\ -28 & 19 \end{bmatrix}$$

a. $\begin{bmatrix} 28 & -24 \\ -7 & 18 \end{bmatrix}$

b. $\begin{bmatrix} 4 & 11 \\ 19 & -28 \end{bmatrix}$

c. $\begin{bmatrix} -4 & -24 \\ 1 & 18 \end{bmatrix}$

d. $\begin{bmatrix} 4 & 11 \\ -28 & 19 \end{bmatrix}$

5. State the dimensions of the matrix. Identify the indicated element.

$$A = \begin{bmatrix} -9 & 1 \\ -7 & 5 \\ -5 & 8 \end{bmatrix}, a_{2,1}$$

- a. $3 \times 2; 5$
b. $2 \times 3; 1$

- c. $2 \times 3; -7$
d. $3 \times 2; -7$

6. Solve for t and y:

$$\begin{bmatrix} -6-t & 0 \\ 8 & -5 \end{bmatrix} = \begin{bmatrix} -5 & 0 \\ 8 & -3y-2 \end{bmatrix}$$

- a. $t=1, y=-1$
b. $t=-11, y=1$

- c. $t=-1, y=2$
d. $t=-1, y=1$

7. Find the determinant

$$\begin{vmatrix} -10 & 10 \\ 5 & -7 \end{vmatrix}$$

a. -120
 $70 - 50 = 20$

b. 20

c. 120

d. -20

8. $\begin{bmatrix} 7 & 2 & 0 \\ -5 & 9 & 9 \end{bmatrix} - \begin{bmatrix} -1 & 3 & 8 \\ 3 & 4 & 7 \end{bmatrix}$

a. $\begin{bmatrix} 8 & 1 & -8 \\ -8 & 5 & 2 \end{bmatrix}$

b. $\begin{bmatrix} 8 & -1 & -8 \\ -8 & 5 & 2 \end{bmatrix}$

c. $\begin{bmatrix} 8 & -1 & -8 \\ 8 & -5 & 2 \end{bmatrix}$

d. $\begin{bmatrix} 8 & -1 & 8 \\ -8 & 5 & 2 \end{bmatrix}$

$$\begin{bmatrix} 8 & -1 & -8 \\ -8 & 5 & 2 \end{bmatrix}$$

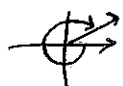
Angles in Trig

Multiple Choice - Choose the best answer for each question.

$\frac{2}{3} \frac{1}{4}$

1. In which quadrant does a -285° angle lie?

- a. I b. II c. III d. IV



2. Which angle is *not* coterminal with an angle that measures 300° ?

- a. -420° ✓ b. -300° c. -60° ✓ d. 660° ✓

$300 - 360 = -60 - 360 = -420$

$300 + 360 = 660^\circ$

3. What is the reference angle for -512° ? *Reference \angle is always pos. + acute.*

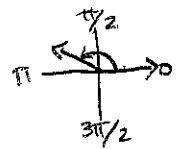
- a. -208° b. -28° c. 28° d. 280°

$-512 + 360 = -152$



4. An angle of $\frac{3\pi}{4}$ radians lies in quadrant

- a. I b. II c. III d. IV



5. The value of $\tan 315^\circ$ is the same as the value of (use unit circle)

- a. $\cos 0^\circ = 1$ b. $\sin 90^\circ = 1$ c. $\tan 135^\circ = -1$ d. $\sin 180^\circ = 0$

$\frac{-\sqrt{2}/2}{\sqrt{2}/2} = -1$

6. Express 330° in radian measure. $330 \cdot \frac{\pi}{180} = \frac{11\pi}{6}$

- a. $\frac{5\pi}{6}$ b. $\frac{5\pi}{3}$ c. $\frac{11\pi}{6}$ d. $\frac{11\pi}{4}$

7. Use a calculator to approximate $\sec 59^\circ$ *secant $59^\circ = \frac{1}{\cos 59^\circ}$ * calculator should be in degrees*

- a. -1.2969 b. 1 c. 1.9416 d. 1.1667

8. Use a calculator to approximate $\cos 14$. ** calculator should be in radians*

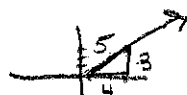
- a. 0.9703 b. 0.1367 c. 0.9702 d. impossible

9. Change 150° to radian measure in terms of π . $150^\circ \cdot \frac{\pi}{180} = \frac{5\pi}{6}$

- a. $\frac{6\pi}{5}$ b. $\frac{3\pi}{5}$ c. $\frac{5\pi}{6}$ d. $\frac{5\pi}{3}$

10. The terminal side of an angle θ in standard position passes through the point (4, 3). Find $\sin \theta$.

- a. $\frac{3}{5}$ b. $\frac{5}{3}$ c. $\frac{4}{5}$ d. $\frac{5}{4}$

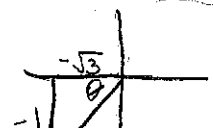


$\sin = \frac{y}{r} = \frac{3}{5}$

11. θ is the measure of an angle in standard position with its terminal side in Quadrant III and $\sin \theta = -\frac{1}{2}$. Find $\tan \theta$. *$\sin \theta = -\frac{1}{2} = \frac{y}{r}$*

- a. $\sqrt{3}$ b. $\frac{\sqrt{3}}{3}$ c. $\frac{2}{3}$ d. $-\frac{\sqrt{3}}{3}$

$\sin \theta = -\frac{1}{2} = \frac{y}{r}$



$\tan = \frac{y}{x} = \frac{-1}{\sqrt{3}} = -\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

12. If $\sin \theta = -\frac{1}{5}$, what is $\csc \theta$? *$\frac{1}{\sin \theta}$ (Reciprocal)*

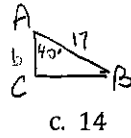
- a. $\frac{1}{5}$ b. 5 c. 0 d. -5

$\frac{1}{-\frac{1}{5}} = 1 \cdot -\frac{5}{1} = -5$

$(-1)^2 + b^2 = 2^2$
 $1 + b^2 = 4$
 $b^2 = 3$
 $b = \sqrt{3}$

Multiple Choice - Choose the best answer for each question.

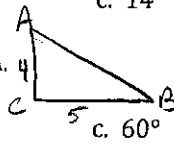
1. In right $\triangle ABC$, $A = 40^\circ$, $C = 90^\circ$, and $c = 17$. Find b .



$\cos 40^\circ = \frac{b}{17}$
 $b = 17 \cos 40$
 c. 14 d. 15

- a. 12 **b. 13**

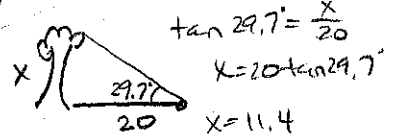
2. In right $\triangle ABC$, $a = 5$, $b = 4$, and $C = 90^\circ$. Find A .



$\tan A = \frac{5}{4}$ $A = \tan^{-1} \frac{5}{4}$

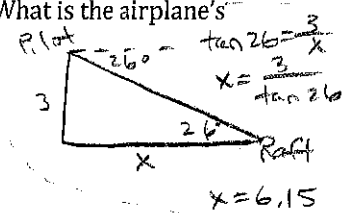
- a. 89.606° **b. 38.660°**

3. From a point 20 feet in front of a tree, the angle of elevation to the top of the tree is 29.7° . Find the height of the tree to the nearest foot.



- a. 136.1 ft **b. 11 ft** c. 14.7 ft d. 594 ft

4. An airplane pilot sights a life raft at a 26° angle of depression. The airplane's altitude is 3 km. What is the airplane's horizontal distance d from the raft? Round your answer to the nearest whole number.



- a. 5 km **b. 6 km** c. 4 km d. 3 km

5. What is the exact value of the cosine of 45° ? use unit circle (cos, sin)

- a. $\frac{\sqrt{3}}{2}$ b. 1 c. $-\frac{\sqrt{2}}{2}$ **d. $\frac{\sqrt{2}}{2}$**

6. What is the exact value of the sine of 120° ? use unit circle (cos, sin)

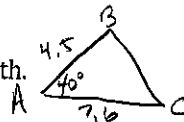
- a. $\frac{\sqrt{3}}{2}$** b. $-\frac{\sqrt{3}}{2}$ c. $\frac{1}{2}$ d. $\frac{\sqrt{2}}{2}$

7. What is the exact value of the tangent of 150° ? use unit circle $\tan = \frac{\sin}{\cos}$

- a. $-\sqrt{3}$ b. $\sqrt{3}$ **c. $-\frac{\sqrt{3}}{3}$** d. $\frac{\sqrt{3}}{3}$

$\frac{\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = \frac{1}{2} \cdot \frac{2}{-\sqrt{3}} = -\frac{1}{\sqrt{3}} = \frac{-\sqrt{3}}{3}$

8. In $\triangle ABC$, $A = 40^\circ$, $b = 7.6$, and $c = 4.5$. Find a to the nearest tenth.



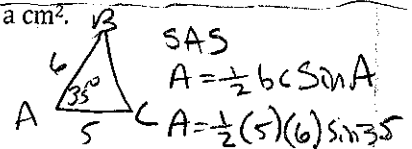
SAS → Law of Cosines
 $a^2 = b^2 + c^2 - 2bc \cos A$

- a. 4.0 **b. 3.0** **c. 5.1** d. 4.5

$a = \sqrt{7.6^2 + 4.5^2 - 2(7.6)(4.5)\cos 40^\circ}$
 $a = 5.060885307$

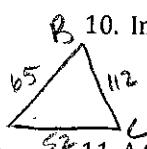
9. In $\triangle ABC$, $A = 35^\circ$, $b = 5$ cm, and $c = 6$ cm. Find the area of the triangle to the nearest tenth of a cm^2 .

- a. 8.4 cm^2 **b. 8.6 cm^2** c. 8.5 cm^2 d. 8.3 cm^2



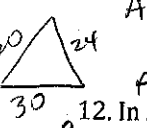
10. In $\triangle ABC$, $a = 112$ cm, $b = 52$ cm, and $c = 65$ cm. Find the measure of angle A .

- a. 56° b. 124° **c. 146°** d. does not exist



$a^2 = b^2 + c^2 - 2bc \cos A$
 $112^2 = 52^2 + 65^2 - 2(52)(65) \cos A$
 $12544 = 6929 - 6760 \cos A$
 $5615 = -6760 \cos A$
 $A = \cos^{-1} \frac{5615}{-6760}$
 $A = 146.1626137$

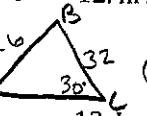
11. A triangle has side lengths of 20 in, 24 in, and 30 in. Find the area of the triangle.



- a. 478.2 in^2 **b. 239.2 m^2** c. 298.9 in^2 d. 358.6 in^2

$A = \frac{20+24+30}{2} = 37$
 $A = \sqrt{37(37-20)(37-24)(37-30)} = 239.2467346$

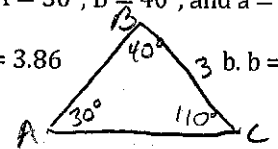
12. In $\triangle ABC$, $C = 30^\circ$, $a = 32$, and $c = 16$. Determine how many triangles can be formed.



- a. one** b. two c. three d. none

SSA $\frac{16}{\sin 30} = \frac{32}{\sin A}$ $\frac{16}{16} = \frac{32 \sin 30}{16}$ c. three
 $A = \sin^{-1} \left(\frac{32 \sin 30}{16} \right) = 90^\circ$ Rt. \triangle

13. In $\triangle ABC$, $A = 30^\circ$, $B = 40^\circ$, and $a = 3$. Find the length of side b .

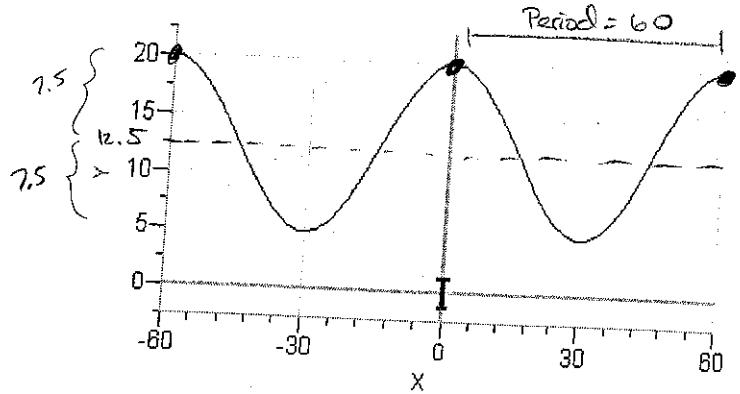


- a. $b = 3.86$** b. $b = 4.86$ c. $b = 5.64$ d. $b = 5.64$

$\frac{b}{\sin 40} = \frac{3}{\sin 30}$
 $b \sin 30 = 3 \sin 40$
 $b = \frac{3 \sin 40}{\sin 30} = 3.856725658$

Multiple Choice - Choose the best answer for each question.

Use the graph shown below to answer question 1 - 3.

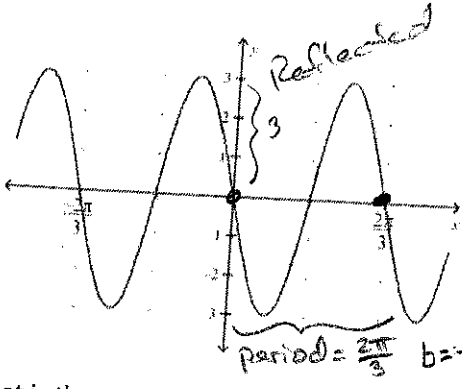


- What is the AMPLITUDE of the graph shown?
a. 15 **b. 7.5** c. 30 d. 60
- What is the PERIOD of the graph shown?
a. 15 b. 7.5 c. 30 **d. 60**
- What is the VERTICAL SHIFT of the graph shown?
a. 12.5 b. 5 c. 20 d. 30
- The amplitude of the graph of $y = -2\cos 3x$ is what value?
a. 2 b. -2 c. 3 d. -3
- What is the phase shift of the graph of $y = 4\sin(2x + \pi)$?
a. left π b. right π c. right $\frac{\pi}{2}$ **d. left $\frac{\pi}{2}$**
- Write the equation of the function shown in the graph.

$$2x + \pi = 0$$

$$2x = -\pi$$

$$x = -\frac{\pi}{2}$$



- $f(t) = 3 \sin 6t$
- $f(t) = 6 \cos 3t$
- c. $f(t) = -3 \sin 3t$**
- $f(t) = 3 \sin 3t$

$$y = a \sin b(x - c) + d$$

$$y = -3 \sin 3(x - 0) + d$$

$$y = -3 \sin x$$

$$\text{period} = \frac{2\pi}{\frac{3}{2\pi}} = 2\pi \cdot \frac{3}{2\pi} = 3$$

- What is the period of the graph whose equation is $y = 3\cos 2\theta$?
a. 80° b. 2 c. 3 d. 360°

$$\text{Period} = \frac{360}{b} = \frac{360}{2} = 180^\circ$$

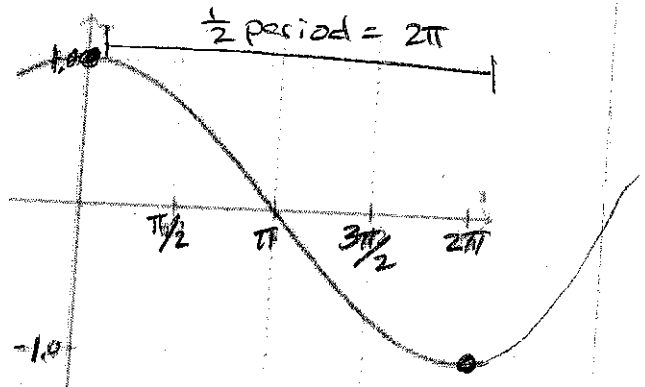
- What is the minimum value in the range of $y = 2\sin x + 3$?

- a. -1**
- 0
- 1
- 5



- What is the period of the graph to the right?

- 2π
- π
- c. 4π**
- 2



- What is the equation for the accompanying graph?

- $y = \cos 2x$
- $y = 2\cos x$
- $y = \frac{1}{2}\cos x$
- d. $y = \cos \frac{1}{2}x$**

$$y = \cos \frac{1}{2}x$$

$$y = a \cos b(x - c) + d$$

$a = 1$
 $b = \frac{1}{2}$
 $c = \text{none}$
 $d = \text{none}$

Period = 4π
 $b = \frac{2\pi}{4\pi} = \frac{1}{2}$